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Grading—Up and Down

We well remember being consulted by the managing director of a foundry concern, who was far from satisfied with the production which was being obtained from his mechanised plant. A visit to the shops disclosed that each mould made on the lines of machines was being titivated up by the operatives. With our tongue in our cheek, we reported back to the managing director, that, so far as we could see, there was one of two things which was acting adversely against production:—(1) Either the patterns were faulty, or (2) the sand was unsuitable. As a rider we pointed out that if in a real quantity production shop a perfect strip was not given on, say, three consecutive moulds, then the foreman's attention was called to the fact and the pattern was changed or other steps were taken. The managing director interrupted our survey with the remark "You know very well that in this district we have to man the moulding machines with skilled men, and nothing can stop them from unnecessarily displaying their skill."

Here, then, was a case of downgrading of skill to the detriment of all concerned. Now, it seems, the machine is to be put into reverse. Primarily, the Government have the intention of inaugurating intensive training courses for men leaving the forces, or maybe the munitions industries, to create as rapidly as possible a corps of semi-skilled men to man the machinery of the industry. At the same time, the semi-skilled men are to be upgraded to convert them into skilled artisans. Mr. G. W. Green, O.B.E., in a talk to the West Riding of Yorkshire branch of the Institute of British Foundrymen, which is reported elsewhere in this issue, evidently had something of this sort in mind, but his audience were more in a reminiscent mood than anything else, and the discussion was not too helpful. However, there was a promise forthcoming that on request details of the intensive training scheme would be made available. We suggest in all seriousness that provision should be made for the inclusion of girls, as production in the foundries in the Midlands is being jeopardised for the want of girl labour in the coreshops and vitreous enamelling departments. The rapid training of semi-skilled operatives for the foundries should present no more difficulties than the staffing with girl labour of the various tank track link or light alloy shops during the war.

The second task, that of upgrading, is more difficult. However, the semi-skilled operative is already familiar with the general principles of moulding, coremaking and casting. He will require careful tuition with the object of inculcating a real sense of responsibility for his own work. For a period there should be no attempt to introduce piecework, as speed in craftsmanship can only come with experience. Pride in workmanship must be created amongst the trainees. When they make their first castings from loose patterns, each man, with his foreman, should visit the fitting shop and any fault should be pointed out, together with the dozens of others which have not occurred, and for which credit must be given. In fact, it would probably be best to have a standard list of potential moulding faults and go through them in a certain sequence, giving credit or making adverse comment in respect of each phase. This system will prevent too much importance being given to any one aspect and will act as an insurance against curing one defect at the expense of another. Generally, we find that this ambition to upgrade is immeasurably more satisfying than the deplorable exhibition of downgrading we referred to initially.

PROF. K. GIERDZREJEWSKI, the president of the Polish Foundrymen's Association, whose address is c/o Lenert, Szlak 20, Cracow, Poland, has, with his wife and family, survived the German occupation and is now managing a large foundry concern near Cracow.

Contents

Grading—Up and Down, 103.—Forthcoming Events, 104.—Midland Ironfounders' Association, 104.—New Standards Issued, 104.—The Gassing of Bronzes by Reaction with Moulding and Core Sands, 105.—Training Problems in the Foundry, 109.—Pyrometry of Liquid Iron and Steel, 112.—Handling Small Cores, 112.—Publication Received, 112.—Application of Time Study to Rate Fixing, 113.—Foundry Work in the 'Seventies, 115.—Pattern Blocks for Small-scale Production, 116.—Steel Developments in South Africa, 117.—New Trade Marks, 118.—Lightweight Piano Frames, 118.—Australian Steel Industry during the War Years, 119.—New Patents, 120.—Anglo-Belgian Industrial Conversations, 122.—Employment in Industry, 122.—In Parliament, 122.—Personal, 124.—Indian Iron & Steel Company, Limited, 124.—News in Brief, 126.—Price of Antimony Raised, 126.—Obituary, 128.—New Companies, 128.—Contracts Open, 128.—Raw Material Markets, 130.

FORTHCOMING EVENTS

(Secretaries are invited to send in notices of meetings, etc., for inclusion in this column.)

FEBRUARY 1.

Institute of Welding (South London branch):—Film and discussion meeting. At Wandsworth Technical School, at 7.30 p.m.

Keighley Association of Engineers:—Ladies' night. "The Beauty of the Burmese Oberland," by John Sugden. At Devonshire Buildings, Devonshire Street, Keighley, at 7.30 p.m.

FEBRUARY 6.

Scottish Engineering Students' Association:—Film night. At the Institution of Engineers and Shipbuilders, Glasgow, at 7.15 p.m.

FEBRUARY 7.

Institute of Welding (Portsmouth branch):—"Application and Development of Oxygen Cutting," by R. E. Doré.

Institute of Welding (N.E. Tees-side branch):—"Welded Construction and the Drawing Office," by H. V. Hill. At the Cleveland Scientific and Technical Institute, Corporation Road, Middlesbrough.

FEBRUARY 8.

Institute of Welding (Birmingham branch):—"The Bronze Welding of Cast Iron," by G. G. Musted. At the James Watt Memorial Institute, Great Charles Street, Birmingham, 3, at 7 p.m.

Institute of Welding (South-Western branch):—"Welding as Applied to Structural Work," by C. R. Harman.

Manchester Association of Engineers:—"Some Applications of the Elasticity of Natural and Synthetic Rubbers to Engineering Problems," by W. H. Reece. At the Engineers' Club, Albert Square, Manchester, at 6.45 p.m.

FEBRUARY 11.

Staffordshire Iron and Steel Institute:—"Gas Turbines and Jet Propulsion," by Dr. S. G. Hooker. Joint meeting with the Wolverhampton and District Engineering Society. At the Victoria Hotel, Wolverhampton, at 7 p.m.

FEBRUARY 14.

Scottish Engineering Students' Association:—Informal dance. At the Institution of Engineers and Shipbuilders, Glasgow, at 7 p.m.

FEBRUARY 15.

Association for Scientific Photography:—"Photography Applied to Physico-chemical Research," by Dr. A. E. I. Vickers. At Imperial Chemical Industries, Limited, Billingham, Co. Durham, at 4 p.m.

Keighley Association of Engineers:—"The Future of Industrial Administration," by G. S. Mason. At Devonshire Buildings, Devonshire Street, Keighley, at 7.30 p.m.

FEBRUARY 18.

Sheffield Society of Engineers and Metallurgists:—"The Future of Co-operative Research in Iron and Steel," by Sir Charles F. Goodeve, F.R.S. At the Royal Victoria Station Hotel, Sheffield, at 6.15 p.m.

FEBRUARY 26.

British Society for International Bibliography:—"The Principles of Alphabetical Arrangement," by A. H. Chaplin, and "An Industrial Information Department," by W. John Merrick. At the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2, at 2.30 p.m.

Institute of British Foundrymen

FEBRUARY 2.

Lancashire branch:—"Technical Records in the Foundry," by R. D. Lawrie. At the Engineers' Club, Albert Square, Manchester, at 3 p.m.

FEBRUARY 5.

Burnley section:—Castings Inquest. At the Municipal College, Ormerod Road, Burnley, at 7.30 p.m.

FEBRUARY 9.

Scottish branch:—"Technical Records in the Foundry," by R. D. Lawrie. At the Royal Technical College, George Street, Glasgow, at 3 p.m.

West Riding of Yorkshire branch:—"Opportunities for the Foundry Technician in India," by J. Blakiston. At the Technical College, Bradford, at 6.30 p.m.

FEBRUARY 14.

East Anglian section:—Short Paper competition. At the Lecture Hall, Central Library, Northgate Street, Ipswich, at 6.45 p.m.

FEBRUARY 16.

Bristol and West of England branch:—"Patternmaking and Material," by G. W. Wearing. At the Merchant Venturers' Technical College, Bristol, at 7 p.m.

FEBRUARY 23.

Bristol and West of England branch:—"The Production and Application of Special Types of Cast Iron," by A. E. McRae Smith. At Gloucester.

East Midlands branch:—"Metal Shrinkage," by Dr. H. T. Angus. At the College of Technology, Leicester, at 6 p.m.

Wales and Monmouth branch:—"Consistency and the Cupola," by C. A. Payne. At the Engineers' Institute, Cardiff, at 2.30 p.m.

FEBRUARY 25.

Sheffield branch:—"Review of Sand-binding Materials and Compounds," by C. Wood. At the Royal Victoria Hotel, Sheffield, at 7 p.m.

FEBRUARY 27.

Birmingham branch:—"Magnesium Foundry Practice," by J. Partridge. At the James Watt Memorial Institute, Great Charles Street, Birmingham, 3, at 7.30 p.m.

London branch:—"Opportunities for the Foundry Technician in India," by J. Blakiston. At the Charing Cross Hotel, London, W.C.2, at 7.30 p.m.

MIDLAND IRONFOUNDERS' ASSOCIATION

The resignation of Mr. J. W. Gaunt as a member of the Executive Committee of the Midland Ironfounders' Association was received with much regret at the recent annual general meeting, and he was elected, by a unanimous vote, the first honorary president of the Association.

Mr. Gaunt founded the Association some years ago, when some 20 firms became members. The present membership is over 160, and the Association is the largest district association in the ironfoundry industry. The new honorary president has been on the Executive Committee since the beginning. His long experience in the industry, his foresight and his sound advice have always been at the service of members of the Association, which has built up an enviable reputation for the many services rendered to its members.

NEW STANDARDS ISSUED

The monthly information sheet of the British Standards Institution for December, 1945, announces that the following new standards have been issued:—1205: Part 2: 1945—Cast-iron gutters, fittings and accessories (2s.); 1251: 1945—Open fires for domestic purposes (2s.); 1272/80: 1945—Magnesium alloy ingots and castings (2s.).

Amongst new work started are the following:—Aluminium alloy castings, and revision of series of B.S. for cast-copper alloy castings.

THE GASSING OF BRONZES BY REACTION WITH MOULDING AND CORE SANDS

By W. T. PELL-WALPOLE, B.Sc., Ph.D.

(*Continued from page* 89.)

Experimental Method

A general experimental procedure suitable for examining independently the effects of most of the factors mentioned in the previous section was suggested by the tests on the gassing of molten bronze by pouring through sand bowls into chill moulds, as described previously. This procedure was modified in order to examine a large range of materials as follows.

A Salamander pot drilled centrally with a ¼-in. hole was lined with a known weight of each substance to be examined with sufficient water to form a stiff loam. The pot was then baked under controlled conditions of time, temperature, and air circulation. A melt of 2B8 bronze was prepared from virgin metals under an oxidising flux (sand 1 part; borax 1 part; CuO 1 part). After thickening and removing the flux, phosphorus was added, and the melt poured through the test-bowl into a 12 in. by 2 in. dia. thin-walled chill mould at 8 lb. per min. and at 1,250 deg. C. (conditions known to ensure freedom from shrinkage defects). The properties of the ingot thus obtained could be compared directly with those of a similarly degassed ingot poured at the same rate and temperature through a clean, preheated Salamander pot. The ingots were examined for exudations, etc., then sectioned, as shown in Fig. 1, for density determinations, tensile tests, micro examinations, and visual examination of the fracture.

The natural sands selected for test with and without the addition of artificial bonding agents were:—(1) A fine red Stourbridge sand, and (2) a coarse sea sand. The mechanical grading of these sands as determined by sieving is shown in Table I. The red sand was also used to investigate the effect of particle size. A weighed quantity was sieved through a 60-mesh to give two grades, referred to as "fine red" and "coarse red" respectively in the following tests.

TABLE I.—*Percentage Mechanical Analyses of Sands by Sieving.*

I.M.M. mesh	Red sand	Coarse sea sand
Retained by 30	1	1
30-60	4	57
60-80	8	24
80-100	32	17
Passes 100	55	1

A limited number of bonding additions was selected from each class:—

A. *Clay Type.*—A pure colloidal clay, aluminous cement, fireclay, water-glass.

B. *Ferruginous Type.*—Limonitic iron-ore fines.

C. *Cereal Type.* — Flour (sweepings). Pure dextrin, a commercial dextrin type, a commercial starch type.

D. *Oil Type.*—Linseed oil.

E. *Oil/Cereal Type.* — A series of commercial oil/cereal products made for use with different sands.

These materials were tested both alone and mixed in various proportions with the sands. In all the comparative tests on sands and bonding agents baking time was ½ hr. for all mixtures, baking temperature 200 deg. C. for organic, 300 deg. C. for inorganic bonds. All melts were poured at 8 lbs. per min., 1,225 deg. C. The effects of variation of baking conditions (time, temperature, air circulation) and of original gas content, pouring temperature, and pouring rate were then investigated for a limited number of sand/bond combinations only. These were made with virgin melts of 2B8 bronze. The effects of bronze composition were then examined separately with one or two selected bonded sands.

DISCUSSION OF RESULTS

General Effects of Gassing on the Properties of Bronze

When molten bronze was poured through the funnel-pot lined with various mixtures to be tested, a visible reaction occurred with violent ebullition. This subsided in all tests before pouring was complete, *i.e.*, the whole quantity of sand mixture present had reacted with the bronze.

Although the ebullition indicated that much of the gases generated escaped to the air, a considerable quantity of hydrogen must have been absorbed by the bronze, since on solidifying most of the ingot tops rose visibly and exuded beads of tin-rich liquid in

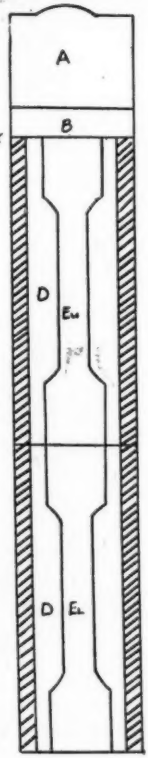

FIG. 1.—METHOD OF SECTIONING INGOTS FOR EXAMINATION CODE. A.—HEAD EXAMINED FOR EXUDATIONS AND DENSITY. B.—SPECIMEN FOR ANALYSIS AND MICROSTRUCTURES. C.—SURFACE MACHINED OFF BEFORE DETERMINATION OF DENSITY OF D, THE 1½-IN. DIA. BAR. EU, EL.—UPPER AND LOWER TENSILE TEST-PIECES.

The Gassing of Bronzes

varying quantities (*see* Fig. 2, A-D). In the most severe cases of bleeding, bubbles of gas were expelled through the molten globules and burned with a yellow flame.

FIG. 2A.

Cross-sectional fractures of ingots with severe exudations showed corresponding gas holes surrounded by a zone of grey segregate. When exudations were less severe the fractures showed smaller distributed gas holes with no visible segregation, while the few ingots free or almost free from exudations had no visible cavities, but showed localised patches of discolouration. Gas-free ingots poured through a clean Salamander pot show uniform fine golden-brown fractures free from any cavities, segregation, or discoloured patches.

Three types of gas porosity were observed in microstructures, corresponding to various degrees of gas absorption:—(1) Large axial gas holes (elongated trumpet-shape in longitudinal section) surrounded by a segregated zone of ($\alpha + \delta + Cu_3P$) (*see* Fig. 3). These correspond to the large gasholes visible to the naked eye in the fracture. (2) Smaller uniformly distributed cavities (Fig. 4). (3) Fine intercrystalline fissures (Fig. 5).

Density and Tensile Properties

Density and tensile properties vary in a fairly regular manner with the visible signs of gas porosity in fractures and microstructures, but in some cases low-tensile properties are accompanied by relatively high densities (Fig 6). This occurs generally when only type (3) cavity is present (fine intercrystalline fissures). This form of porosity has little effect on density, but greatly reduces tensile properties, since very little extension can occur, hence little work-hardening, *i.e.*, the ultimate tensile strength is little higher than the yield point (about 12 to 13 tons per sq. in.).

An approximate correlation of density and mechanical properties with visual signs of gassing is shown in Table II, the results being grouped into four classes, according to the degree of gassing (*see* Fig. 2, A-D) for ease of reference in the following discussions. A more quantitative expression for the degree of gassing is shown as the "Gassing Index" in the various detailed tables of results to be printed later. The tests on the effect of quantity of sand mixture on the extent of gassing, showed that an approximate linear relation exists between porosity

FIG. 2B.—MODERATE GASSING. CONSIDERABLE EXUDATION. FLAT TOP.

FIG. 2C.—SLIGHT GASSING. SLIGHT EXUDATIONS. SUNKEN TOP.

FIG. 2D.—GAS-FREE. NO EXUDATIONS. SUNKEN TOP.

in the bronze (as determined by density) and weight of sand involved in the reaction (*see* Fig. 7). From this relation was calculated a ratio (or "Gassing Index," P_W or P_D), indicating the porosity which would be produced by a standard weight (100 gm.) of wet (P_W) or dry (P_D) mixture, acting on 12 lbs. of molten bronze for the conditions of test stated in the tables to appear later. The P_W and P_D values

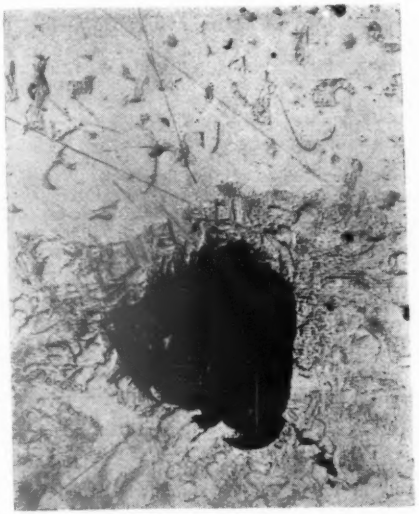

FIG. 3.—COARSE CENTRAL GAS HOLE SURROUNDED BY SEGREGATED $\alpha + \delta + Cu_3P$. × 250. (2B8 BRONZE.)

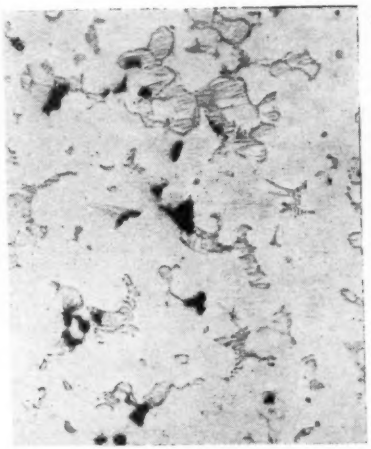

FIG. 4.—DISTRIBUTED GAS POROSITY. ×250. (2B8 BRONZE.)

TABLE II.—*Correlation of Visual Gassing Phenomena with Density and Tensile Properties in 2 in. × 12 in. Chill-cast Sticks of 2B8 Bronze Poured at 8 lb. per min.*

Classification	Surface appearance	Fracture	Micro-structure	Bulk density	U.T.S. tons/sq. in.	El., per cent.
Severe gassing, 1	Much exudation, "spitting." Rising in mould. White surface	Visible gas-holes and grey patches of segregated ($\delta + Cu_3P$)	All three types of porosity	<8.50	>20	<10
Moderate gassing, 2	Slight exudation. No spitting, no visible rising. Yellow surface	No visible gas-holes, but patchy discoloration	Fine distributed gas-holes and fissures	8.50 to 8.60	20 to 24	15 10-20
Slight gassing, 3	Very slight exudations. Sunken top. Red-brown surface	Occasional patches of discoloration	Gas fissures and normal fine pinholes	8.60 to 8.75	24 to 27	15 to 20
Gas-free, 4	Sunken top. No exudations. Red-brown surface	Uniform	Shrinkage pinholes only	8.75 to 8.80	26 to 29	20 to 30

D

The Gassing of Bronzes

FIG. 5.—INTERCRYSTALLINE GAS FISSURES. ×500. (2B8 BRONZE.)

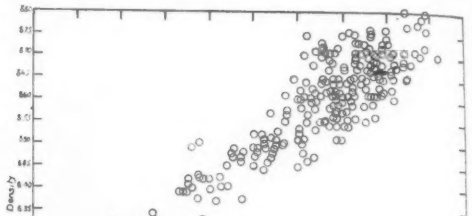

FIG. 6.—RELATION BETWEEN DENSITY AND TENSILE STRENGTH.

for a given mixture differ in proportion to the quantity of water absorbed to give a loam of the consistency required to line the pot. This free moisture is driven off in the subsequent baking, and should not be confused with the combined water, which is driven off only at bright red heat and which is responsible for the reaction with the bronze:—$H_2O + Me \rightleftharpoons MeO + 2H$.

The P_D values are of the most general interest, being applicable to sand moulds, pouring bowls, etc. The P_W values are important for the selection of loams for coating chill cores for casting cored sticks.

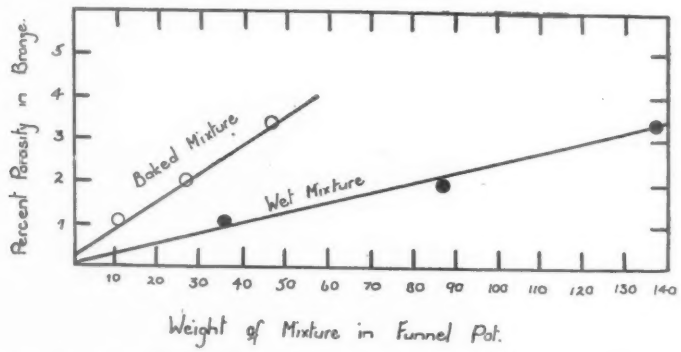

FIG. 7.—RELATION BETWEEN QUANTITY OF SAND MIXTURE REACTING AND POROSITY PRODUCED IN BRONZE.

(To be continued).

TRAINING PROBLEMS IN THE FOUNDRY

RECENT EXPERIMENTS WITH APPRENTICES

A Paper on "Training Problems in the Foundry" was given to members of the West Riding of Yorkshire branch of the Institute of British Foundrymen at a meeting held at Bradford Technical College last month by Mr. G. W. Green, O.B.E., manager of the Ministry of Labour and National Service Training Centre at Kirkstall Road, Leeds. Mr. James Timbrell, president of the branch, was in the chair.

MR. GREEN opened his address by reminding the audience that Sir Stafford Cripps (President of the Board of Trade) said recently that engineering could not get back to its peacetime production because of a shortage of foundry workers, and from that point went on to illustrate how in his experience the foundry had come to be regarded as a place not too desirable to work in. The conditions concerned with this were outlined by Mr. Green, who felt (*a*) working conditions in the foundry were poor; (*b*) that because industry had not yet come to regard the foundry and the welding fabrication shop as complementary, and because of the generally backward state of mechanisation in the foundry, there was the false threat of obsolescence to the craft; (*c*) that moulders were so badly trained as to make it regularly necessary to call in the patternmaker for advice and directions, and the metallurgist for simple control purposes; (*d*) that technical education did not cater properly for the foundryman; and (*e*) that the true foundryman, as distinct from the patternmaker or metallurgist employed in a foundry, rarely obtains high promotion in and through the foundry as compared with the promotion of, say, mechanical engineers in and through engineering workshops, and that the inferiority complex induced by conditions such as those described above was intensified by the attitude to the moulder.

Finer Points of Moulding

Moulding was a very skilled and very interesting craft, and many high engineering executives who in "serving their time" had been through the foundry had stressed the profound interest the foundry held for moulders as compared with other branches of engineering in which they had received some training. There was a very grave danger that the craft would be something of a lost art, especially with regard to some of the finer points.

Mr. Green felt that the position could be rectified to some extent at least, but that it was not possible to do this except by dint of slow and gradual improvement in many directions. So far as apprenticeship training went—and training was one of the very important directions in which improvement was necessary—he felt that lessons could be learned from recent experiments concerned with the training of apprentices. The underlying ideas concerned with these experiments were that the period of apprenticeship was split up into a number of distinct phases, each of which occupied, say, six months. During the first month of each six-monthly period the apprentice was given a basic training which concerned itself entirely with the curriculum for the six months, and which was given in some place where production was a matter of no importance, *i.e.*, in the apprentice training centre. The balance of the six-monthly period was taken up by applying the training given in the training centre to production work on the shop floor. At the end of the six-monthly period the apprentice's craft skill was checked up in the training centre and bad habits were rectified. He then proceeded to take a month's course in connection with the next six-months' phase of his apprenticeship training. In an industrial concern the training centre should be isolated from the shop floor.

The experimental work already carried out in connection with this scheme shows very pointedly that, given the proper type of instructor (and he must be selected with extreme care), the interest, appeal, and the romance of engineering can be so developed as to bring about a desire for extensive increase in craft and technical knowledge. The result was that a large proportion of apprentices started to attend evening school classes of their own free will.

Interest Angle

Further experiments in connection with this method of training as applied to the foundry brought about a change of conditions whereby a grave shortage of apprentices to the foundry was overcome, and the foundry came to be regarded as a place of considerable interest. The interest angle must obviously be the governing factor which caused the success of a scheme of this kind.

Mr. Green wound up by saying that in these days of falling birth rate, and rise in school-leaving age, shortage of labour would become more and more acute. Without such shortage the position regarding recruitment of labour to the foundry would in the ordinary way have become much worse. He felt that because of factors of the kind outlined as operating against recruitment for skilled labour the foundry trade had a special responsibility, which was to tackle the problem of ensuring that foundry work could be proved to be really attractive. This problem must be attacked with all the energy the industry could command, so that not only would the foundry receive its fair share of whatever labour was available, but also that, by the very interesting and efficient training which he thought would be possible by methods such as he had very briefly outlined, there would not only be no further deterioration in the dignity of the craft of foundryman, but that the industry could attain the position where the foundry craftsman was much more highly skilled than ever before.

DISCUSSION

Inviting discussion, the CHAIRMAN said that Mr. Green, though now engaged on training work in a variety of trades and industries, had shown himself to be in possession of considerable inside knowledge of

Training Problems in the Foundry

the foundry industry, which enabled him to offer both criticisms and suggestions of a practical nature.

MR. G. W. NICHOLLS (Halifax) suggested that one of the main reasons for deterioration in the industry was the short-sighted policy of boards of directors of engineering companies in the matter of spending so little money on foundry plant as compared with the machine shops. By installing modern mechanism, the industry would attract youth. Mr. Green had mentioned how little opportunity many moulders got of knowing something of drawing or metallurgy, and one was afraid that was only too true. At the same time, the response to training efforts was not always encouraging. In his works the management installed hot baths and lockers as amenities, but the average lad continued to go home as dirty as ever. Visits from boys of school-leaving age to the foundry, where demonstrations were given, had proved to be practically useless.

A Planned Training Scheme Essential

MR. GREEN said Mr. Nicholls had confirmed his views. Mere financial encouragement was insufficient. The industry must attract the best type of lad and then must make the job itself attractive. With adequate recruitment, one could weed out the unsuitable and be more selective as to real aptitude. It was not so much a question of mechanisation or otherwise that would solve the problem of young labour. The foundry referred to which had a training centre in the shop was one of the oldest types of foundry and lacked a certain amount of mechanical aid, and yet it was getting results in good apprentices and training good craftsmen. The plain fact was that lads who had a half-day visit to a foundry already had their minds made up more or less, and what they were able to see on such a visit was insufficient to change their minds. The foundry must set its stall on a definite and planned scale to attract boys of the right calibre.

Continuing, Mr. Green thought the age of 14 was too young to decide definitely on a career, though it was possible that any influence that might begin to be exercised then might be helpful, but as one who had had much contact with young men between 16 and 25, he had found it was the exception who really knew what he wanted to be even up to the age of 18. It was not until they arrived at an age where they could think seriously for themselves about their future and accept serious guidance that one could expect the best results. A personal view was that a lad was not really fit to start on his vocational career until he was 18 or so.

Technical School Courses

A MEMBER, asking if Mr. Green had seen the syllabus of some of the engineering courses in technical colleges, said he felt there was a need for more "breaking up" into sectionalised work—the moulding course given to a practical moulder, patternmaking to a patternmaker, and so on, rather than the more generalised course usually offered. It seemed to him the Institute of British Foundrymen might raise this point with the technical colleges as a point of policy.

Another Committee Urged

MR. GREEN said he would strongly suggest that the Institute might set up a committee to go into the whole matter of making foundry work attractive enough to get the boys in. So far he had not seen a college syllabus which met his conditions—one that was both comprehensive and attractive and fully suitable for the lad who was proposing to take up foundry work as his career. Birmingham and Sheffield Universities, he agreed, had their diploma courses, but they were on the higher grade and were not quite what he meant.

A MEMBER referred to the comprehensive course organised by the Constantine Technical College. This led to a higher course involving laboratory work and the City and Guilds of London Institute certificate. He urged that a college should endeavour to give a full and complete course in foundry practice for foundry students, and be taught by a practical foundryman or patternmaker according to subject.

MR. GREEN said he could not agree that any technical college could be expected to give the complete training that a lad must have. Part of the training should be in a technical school, but part—and it was an important part—must be on the foundry-shop floor. Part also should be definitely in the nature of a cultural character. To accomplish the task properly required all three—no one phase was sufficient. Knowledge could be imparted at the school, but where was the lad going to get practical experience except on the shop floor? Mr. Green agreed that the lads must not be forced into any phase of the training—it must be of their own free will with a desire to learn, and that must be guided by making it attractive. Another point was that he (Mr. Green) did not like evening classes—it was not right, nor was it desirable, if it could be avoided by any system of daytime study, that a youth should have to go to evening classes after a day's work, when mind and body were "stale" and needed rest or relaxation. It might be perfectly true that the ordinary average foundry could not afford to have its own individual training centre, but what was to prevent a group of foundries in a given area setting up a joint movement of that kind? Mr. Green referred to the recommendations of the Committee comprising leading industrialists, trades unionists and educationalists set up in the Manchester district, which included engineer-courses on these lines and which incidentally bound the boys for the first two years of their apprenticeship to the training centre rather than to their individual employers, and he would suggest that that could be done in the foundry industry.

Acknowledgment to Earlier Endeavour

MR. A. S. WORCESTER (Huddersfield), past-branch-president, said he highly appreciated all Mr. Green had said and he accepted the frank criticisms in the spirit in which they were voiced. At the same time, Mr. Green must not suppose the foundry industry had utterly neglected the educational side. There were men in the Institute who were growing grey in the educational movement for the craft, and they felt they had achieved some measure of success even though the youth labour situation, thanks to various circumstances, had become unquestionably serious. The

average age among moulders to-day was 56 years, and that was a very grave problem, because if it be accepted that one could train a moulder fully in less than seven years, that meant that in the next few years the industry was going to have half its skilled moulders passing out and next to none coming in. There was, nevertheless, more craftsmanship even now in the foundry industry than in many others. In the West Riding area there were some 287 foundries and out of that figure about 200 could be classified as small concerns. Every one of them could justify its existence and in many instances they had some really good craftsmen. It was perhaps unfortunate that a foundry could be started up with very little capital if it was a foundry and nothing else. Nevertheless, plenty of these small places were producing a good job—and all were wanting craftsmen, yet it must be recognised that it was no easy matter to make foundries attractive.

Piecework for Youths Detrimental

MR. GREEN disagreed with the notion that it took seven years to train a craftsman moulder. He doubted whether one could train him fully in 27 years, but he thought he could produce a dozen potentially good craftsmen from one instructor in six months by intensive methods if given a suitable type of lad. The trouble with the industry was that half the apprentices never were trained—they were merely exploited. Get away from that kind of so-called apprenticeship and there was a chance of achieving something. The proposition was not easy, but to deal with it one must not dwell on the difficulties, but concentrate on the possibilities. If methods were varied in some ways, one might probably get more interesting results. It was not the foundry building which mattered so much as the training given in it, though the building and amenities counted for something, of course. What mainly mattered was what was being done on which the youth could concentrate his mind and ambitions. It was the training methods which could be made more attractive without spending a quantity of money on structural improvements. No single foundry could hope to train a man fully. Youth should have opportunity to go into other places and see problems which did not arise in his own place and see how they were tackled, and thus spread the interest in his mind and outlook. An interchange of foundry visits for appreciable periods (say, one month) by apprentices in their later stages would be a very good move. It was quite wrong that an apprentice should be allowed to work on a system which enabled him to make extra immediate earnings by piecework. The fundamental in training was the correct use of tools, and if one tried to force speed and experience by the mere offer of a few extra coppers, one was offering anything but training.

Founding an Incentive

MR. W. G. THORNTON (Bradford), past-branch-president, said Mr. Green had perhaps painted rather a black picture of the foundry industry, but it was as well he had done so, because it was to a large extent justified and executives must take full note of Mr. Green's criticisms and think what might be done to meet them. Mr. Thornton said he had been hoping that the speaker might have outlined a detailed training programme. The industry to-day seemed to be training more for executive positions and did not seem able to get hold of the craftsmen. This was because the moulders of to-day had their minds on making more immediate money—conditions of the time probably contributed something to this state of mind—and Mr. Thornton fully endorsed Mr. Green's view that apprentices should not be allowed to go on to a bonus system during training. On the other hand, if the boys were not to be allowed to go on bonus work, they must be given some sort of compensating incentive.

Intensive Training Scheme Details Offered

MR. GREEN said there were better methods of incentive than the piecework bonus for the youth under training. Discipline was necessary for good training. The working man of to-day, unfortunately, did not seem to have the industrial discipline of former times, but one could not offer a bonus for discipline as such. One could, however, give a bonus for study—attendance at evening school if no day course was available—for regular time-keeping, and for certain specified elements of discipline evidenced by genuine interest in the job. As to a detailed training programme, if the Institute thought the speaker might be helpful in the building up of a training syllabus, he would welcome the opportunity of co-operation in that regard.

MR. G. H. POLLARD (Bradford), hon. secretary, asked whether it was possible to do something to educate parents to realise the potentialities of a good apprenticeship as distinct from a job producing quick money. The Government now recognised the importance of the foundry industry and one hoped they realised also the grave position in which it was situated in the labour problem. The smaller foundries also could hardly be expected to be interested in teaching a youth any phase of the job in which the foundry itself was not concerned, and unless they were in some way forced to do it—especially if the executives or owners were not personally foundrymen themselves—not very much could be expected from them in the way of training opportunities. Was it possible for the Government to help by some method of informing parents of the advantages of the industry and seeing to it that those advantages would be realised by the youth who was put into the industry?

MR. GREEN said the Ministry of Labour had been doing that very thing for some time. It had quite recently issued brochures describing about 40 trades and industries or crafts, and he believed they were obtainable from the Appointments Board. In regard to educating the parents, in the training centre in the North, which he had previously mentioned, there was an annual parents' day when visits were paid and the lads were also allowed to make certain little things of a useful nature in the house and take them home to illustrate what they could do.

MR. NICHOLLS said he agreed that the industry must plan the training of apprentices, but the onus could not be placed entirely on the employer, and they must look to the local technical schools to help. Could Mr. Green suggest how the lads were to be obtained?

Training Problems in the Foundry

MR. GREEN said he would avoid putting the onus on the Government, on the employers or on anybody else in particular. Any one of them might say it was the business of the others. It was a matter of co-operation and the big question was how was the industry going to get the best type of lads. He did not think the industry was going to get them in anything like the number it would like; there were many indications that numbers might be smaller, and if that was so, it was more important that the industry must have the quality to cope with what the future holds and to fight against any further deterioration.

Vote of Thanks

MR. D. W. HAMMOND (Bradford), moving a vote of thanks to Mr. Green, said, in his own view, one of the factors which enabled an industry to generate a body of trained craftsmen was the assuredness that the industry would have continued prosperity so that the trainees could be assured of security and prospects. He felt there was no doubt they would have to introduce more science into the foundry to improve its conditions and thereby make it more attractive to young people than it had been in the past, when the foundry side had often been the first to feel the pinch if anything had gone wrong.

Mr. J. Stott (Bingley) seconded. Mr. Green suitably responded.

PYROMETRY OF LIQUID IRON AND STEEL

One of the most important variables in the smelting of iron and refining of steel, says H. T. Clark, in a recent issue of the "Iron and Steel Engineer," is the temperature of the liquid metal. It regulates to a major degree the reactions taking place in the furnace. It affects the life of the steelmaking equipment and the properties of the ingot. A number of investigators have developed methods of measuring liquid iron and steel temperatures in furnace, ladle or mould. Thermocouples of several types and various forms of radiation-measuring pyrometers have been used with varying degrees of success. The thermocouples withstand the temperatures encountered, but there are questions of calibration at these temperatures, contamination by furnace gases, and mechanical fragility, erosion and solution of protecting tubes. Radiation instruments, including optical pyrometers, are not subjected to extreme conditions and function satisfactorily for the measurement of high temperatures. They require, however, a direct view of the metal surface or of a second surface at the same temperature as the metal. The quick-immersion technique with the platinum thermocouple and the open-end tube immersion pyrometer with photoelectric cells or total radiation pick-up units are recent developments which show considerable promise and are being put to practical use.

HANDLING SMALL CORES

Small diameter cores, made from ordinary split core-boxes, can be easily transferred from the box to the core plate by using the fine vent wire for lifting. This

FIG. 1

method avoids the use of packers, or making half flat back cores, which require sticking after being dried.—J.T.

PUBLICATION RECEIVED

Standard Specifications of Aluminium and Aluminium Alloys. Published by the British Aluminium Company, Limited, Salisbury House, London Wall, London, E.C.2.

This publication sets out in tabular form all the current specifications as issued by the British Standards Institution; the Directorate of Technical Development of the Air Ministry; the Ministry of Supply, and the Light Metals Control. These cover in all something approaching 200 specifications, of which roughly a quarter are related to casting alloys. These two facts alone stress the utility of having the complete range assembled in one pamphlet. A limited number of copies is available for distribution to our readers on writing to the publicity manager of the company.

DR. A. T. BOWDEN has been appointed chief research engineer to C. A. Parsons & Company, Limited, Heaton, Newcastle-upon-Tyne. DR. J. M. ROBERTSON has been appointed research metallurgist. Dr. Bowden graduated in engineering at Edinburgh and later became Associate Professor of Mechanical Engineering at the University of Western Australia. He did much research work in the application of producer-gas to farm and road vehicles. At the beginning of the war, he was appointed Assistant Director of Tank Design at the Ministry of Supply. Dr. Robertson graduated at the Royal Technical College, Glasgow, in 1922. In 1926 he became research metallurgist with the Safety in Mines Research Board, London, and in 1928 he joined the Metallurgy Research Board of the Department of Scientific and Industrial Research. He also helped at the Ministry of Supply with tank design during the war. The new appointments are in connection with the development plans that are being promoted by C. A. Parsons & Company, which are expected to cost over £1,000,000.

APPLICATION OF TIME STUDY TO RATE FIXING*

By H. S. WARD

Time study is a method of breaking down the operation done into detailed elements or parts of the operation. Motion study is also linked with time study, inasmuch that motion study determines the most efficient method of working and so eliminates wasted effort or operations. The aim of the time study is to determine the correct amount of time for a given amount of work. The most efficient method of working must always be considered prior to the application of the time study, and in the following remarks it will sometimes be assumed that this factor has been given its full consideration. Everybody applies motion study to some degree by trying to avoid complicated methods of production and so aiming to produce work as economically as possible. Whether a job justifies a time study depends entirely upon the quantity on order and the likelihood of repeat orders.

In the application of time study to rate fixing, the following five factors play an important part:—(1) The make-up of the time study form; (2) the time-study observer (or rate fixer); (3) the operator; (4) the allowances; and (5) the details.

Make-up of the Time-study Forms

The time study is designed to allow for the breaking down of the operation into approximately 15 elements for a moulding job cited, and this number is generally ideal for work of a repetition nature. Where the class of work takes considerable time to produce, then the time-study form would require modification to suit. Each column is sub-divided and headed "consecutive" and "independent" times. At the actual time of recording the study, the rate fixer only inserts the consecutive times. The independent times are part of the office calculations.

The breaking down of the operation should not be done to the extent of distracting the time-study man's judgment of the operator's ability. Both factors must be considered. There should be no secrecy regarding the recordings of the time study, and any operator who shows interest in its application should be given the opportunity to understand it.

Recording of the Time Study

The recording of the time study is very simple. Upon completion of each operation it is continued until sufficient moulds are timed. Decimal watches are used to simplify the calculation of the study. "Seconds" watches can be modified to the decimal variety without difficulty. All elements used should be standardised, so that all time-study men record times which can be compared and, by so doing, it is always possible to revise any element in the time study. This is a very successful method to apply when the original base time has been proved satisfactory and considerable time is saved by eliminating a complete recheck. For example, placing a flask on to the machine and returning the hoist to its idle position would be commenced when the operator prepared to obtain the flask, and would be finished when the hoist is returned to its idle position. This is termed a standardised element.

These detailed records which accumulate can often be used as a basis to determine a piecework rate for batch work which does not justify actual time studies. A sound basis is also available for estimating and costing purposes. Elements which incorporate additional work to the standard element are, wherever possible, split up.

Period of Time Study

The period of the time study is such as to enable the observer to obtain a fair incentive basis. This period depends entirely upon the class of work and can vary between minutes, hours, or even days. For example, a job made on a small air press machine and the production being approximately 20 moulds per hr. —then 10 to 15 moulds would generally be satisfactory. This depends upon the difficulties experienced on the job and the variations in times recorded. There is no set period of recording for any job—the rate fixer stays until he is satisfied that the time study shows a true reflection. Upon completion of the time study period, the calculations can be made. This part of the study will be dealt with in conjunction with the allowances.

Time-study Observer

The time-study observer must be a man with full knowledge of the class of work to which he is attached. He must obtain the confidence of the operator so that a fair timing is obtained. The success of any time-study department, no matter what system of payment is applied, hinges upon gaining the confidence of the operator. Having received a fair timing it remains for him to ensure a fair incentive basis and any doubt he may have at this stage regarding the incentive, should be given to the benefit of the operator.

Possessing the necessary knowledge, he must be a man of the correct personality, and understand any problems that may arise during the time for the job. He must have the patience and the willingness to help the operator to overcome these temporary difficulties. He must be genuine in what he does and what he says, and must be a man who always keeps his word. The time and care taken to build up this confidence in an organisation can be broken down almost immediately if a rate fixer does not abide by his word.

The Operator

In the past, the practice of timing the fast operator (which from the rate fixer's point of view may have

*A contribution to a symposium on "Rate Fixing," organised by the East Anglian Section of the Institute of British Foundrymen, Mr. D. Carrick presiding. The Author is on the staff of Crane, Limited.

Application of Time Study to Rate Fixing

been a safe basis) often resulted in piecework productions which average operators could not maintain. The accurate rating of the operator's ability is one of the most important factors in rate fixing. The considerable detail which time-study elements offer will often serve as a reliable check upon the ability rating applied by the observer.

The recent awards made, which have incorporated a clause that the average worker must be able to earn 27½ per cent. more than his base rate, and the differences in national awards for pieceworker and time worker, will naturally result in the request for the revision of those incentive rates which do not fulfil this clause. In reviewing any request for the retiming of a job, then providing the methods being applied are comparable with the methods detailed against the piecework rate, there are only two factors to be considered, namely, the piecework rate of the operator. First, if the piecework rate is unfair, then it must be adjusted—there is no economy in the application of piecework rates which have no incentive. Secondly, if the operator is at fault by being below the average ability, this may probably be due to the short period of time he has worked on the job.

One often hears the remark that the present-day standard of the average operator is lower than the pre-war standard, but has not this 8s. difference in the national award for a pieceworker and time worker caused part of this tendency? His 27½ per cent. piecework allowance is really reduced to 15 per cent. over his day work basis, and operators view the matter from this aspect.

The true spirit of understanding and co-operation is only maintained by ensuring that time studies showing the average operator and those above the average always receive the fairest possible treatment. To fall short of this commitment will result in the breaking down of the confidence in the rate fixer. When in doubt, there is nothing lost by giving the benefit to the operator who has played his part by giving a good, fair time study.

To the operators below the average (and this is stressed as being those genuine operators who have yet to make the standard grade) it is not always advisable to be too anxious to apply any form of incentive. (Calculating on a 56s. 6d. base rate with a 25s. 6d. national award, operators who fall into the above class are those rated below 90 per cent. with no immediate prospects of improving.) To the "go slow" operator (those who work below the average and are capable of much faster working), there should be extra caution to ensure that any incentive basis applied will not act as an encouragement to others to do likewise. Any doubt should never be to this class of operator's benefit. This factor of the average worker being able to earn his 27½ per cent. is rather vague. The standard of the average worker is not universal and every foundry has its own views of what an average man should produce. The general standard of the foundry efficiency will help to make the operator more efficient. The amount of effort required may be reduced where the use of mechanical aids and equipment is part of the set-up.

Upon calculating the base time, certain allowance factors have to be added before applying the ability rating. The standard allowance factor is generally 10 to 15 per cent. and remains constant. Work of a heavy or hot nature will justify a fatigue allowance in addition to the standard allowance. (Heavy work is intended to apply to the continuous handling of smaller castings over a period of time, and not to the lifting of castings which justify the use of a hoist.) It is recommended to commence this fatigue allowance when the weight handled is approximately 15 cwts. to 1 ton per hr. This fatigue allowance may increase to as much as 20 per cent., but it is recommended that at this stage, investigation would be advisable in aiming to reduce the effort being employed.

The Details

Lack of details when making a time study can be the root cause of bad rates and excessive earnings. The more efficient a foundry becomes, the greater the need for exact details, because changes in methods are gradually reaching the stage when further improvements are difficult to apply. Even when it is necessary to estimate the piecework rate, it is very important to obtain the details of methods applied. Details such as type of pattern, loose pieces entailed, types of cores used, flask used, methods of lifting, etc., should always be shown. This detail proved to be of considerable help to the foreman, as it showed the methods previously applied. With the variety of castings being produced, the foreman cannot be expected to memorise every detail on every product. Also, each foreman responsible for an operation towards the completion of the product, has the detail to assist in eliminating errors. For example, insufficient venting of cores when originally made, may have caused blows in castings. The details of the coreroom foreman's card would show venting operation for cores and so avoid repetition of previous troubles.

It is recommended that when the number of men in the gang is altered, then, due to the changed conditions, a separate piecework rate would be necessary for the revised gang. It cannot be assumed that when a moulding gang is increased from three to six men, that the same increase in production can be expected. Also, the idle time factor of part of the gang may tend to increase.

In concluding, it should be emphasised: (1) The stopwatch is always placed into the hands of qualified men; (2) everything is done to encourage fair timing; (3) there is no exploitation of the ability of those operators above the average; and (4) that it is realised that everybody (whether both operators and staff) belong to an industrial nation whose livelihood depends upon producing the necessities of life at an economical price, then the rate-fixing department will play a very successful part in any foundry or organisation.

DISCUSSION

MR. W. L. HARDY opened the discussion by referring to the fatigue allowance figures mentioned for the

foundry and inquiring if there was any comparable form of payment made in the machine shops. He would be interested to learn, furthermore, what the reaction was when an operator earned excessive piecework on any one job. Was the rating for that job adjusted?

MR. WARD, in reply, said that due to the light class of work with which his firm was engaged, no form of fatigue payment was found necessary in the machine shops. It was only in the foundry and fettling shops where the handling of medium weights over a long period made this desirable, payment starting at the level of 1 ton per hr. and rising to as high as 20 per cent., with, for example, very heavy flasks. If a particularly good operator earned excessive piecework on a job, it was the policy of the management to "grin and bear it," as it was felt that any attempt to reduce the rate would result in a loss of confidence by the operator in the system. Careful initial time study, however, reduced such cases to a very small proportion.

MR. C. J. LAKE did not quite understand how Mr. Ward assessed the skill and arrived at a rating for a particular operator. Did each operator have the same rating for the same job, or different ratings for the same job?

MR. WARD said that the rate for the "average operator" was governed by the standard of the men in the department. In another firm the rating might well be higher, but no greater effort would be required per man. In his particular case the rating rose from casual labour, to air-press machine operators, to jolt and roll-over operators, and so on.

MR. LAKE: If Mr. Ward has a new operator come into the foundry, how is he assessed?

MR. WARD said that as it was obviously impossible to adjust a rate to suit each new operator, a new hand was temporarily put on a day-work basis, until such time as he became sufficiently skilled to warrant piecework rating.

MR. D. CARRICK thought that the point Mr. Lake had in mind was how to assess the efficiency of an operator. This was a difficult job and was often undertaken in the first instance by the time-study executive relying on the foreman of the department to observe and give his opinion whether the man was above or below the average. If the operator was obviously good the tendency was to rate him higher, so giving him the benefit of good time, while if he was slow or "slacking" he was accordingly rated lower.

MR. LAKE asked if, as Mr. Ward had dealt with assessing and ability rating of the men, how did he deal with female labour?

MR. WARD replied that in principle the same method applied, but it was found that women operators in general tended to get flustered in the presence of a time-study man, and allowance for this had to be made. Similarly, women usually yielded a high rate to start with when first rated, but found that they could not maintain it. It was the job of the time-study executive therefore to allow for these contingencies, as when a job is timed it should be maintained.

FOUNDRY WORK IN THE 'SEVENTIES

By T. R. HARRIS

Glimpses of the methods in vogue in a former day can often be caught from some notice in the Press of the period. Recently, turning over the files of some old newspapers of 1875, the writer came across a description of "The Casting Foundry of Messrs. Harvey & Company, of Hayle." The report says, "In this extensive building" (alas now in ruins) "something is always in progress. If they are not casting beams or cylinders, pumps or smaller matters are sure to be in hand. The cupola furnace, constantly kept charged, continually yields steady supplies of molten iron, which the men carry about in single- or double-handled ladles, as if they were so much water. Huge iron kettles there are, capable of holding many tons of the fiery liquid, and fitted with gear to shift them to the exact spot required and tip them when they attain it."

Such a kettle was in process of filling "ladle by ladle" at the time of the reporter's visit. It was said there was practically no limit to the size of the casting made and it is purely a question of arrangement whether a casting should be a couple of tons or 20. Lying in the yard at the present moment are beams of eight or nine tons weight, cast very recently, as the date which they bear—1875—testify. Messrs. Harvey always cast the name and date in one of the machine articles, and there could be no better proof of the thorough excellence of the work than the sharpness of those letters and figures, which have all the appearance, but are not, of being finished by hand."

Cylinder Castings

The largest castings were those for cylinders, "a common size for which is 90 in. or 7 ft. 6 in. in internal diameter, though they are frequently made much larger." Not always had the products of the foundry been of a peaceful nature, large motors were cast for the Government at the time of the Russian war.

"To secure the greatest strength and even quality of the iron," continued the report, "they were cast double the length required, the muzzle portion cut off and the chamber bored. It is usual in these castings to keep the metal stirred while it is cooling, in order that it may solidify in the most perfect and homogeneous manner. When these mortars were in hand the metal in the mould had to be stirred for a dozen hours."

Some years later, in 1886, the Penzance Natural History Society visited the foundry where "arrangements had been made for the visit, and the casting of sundry portions of the machinery for the Severn Tunnel Works had been so timed as to give the visitors an opportunity of seeing this interesting operation. The expedition with which the huge basins of molten metal were transferred from one place to another and the contents finally emptied into the mould, was a sight that few would have cared to miss, and that hardly any who witnessed would soon forget."

PATTERN BLOCKS FOR SMALL-SCALE PRODUCTION*

By S. YATES

It is not intended in such a short Paper to try and cover the whole range of pattern plant necessary for such a variety of castings as are now being made in the local foundries. It is proposed, therefore, to confine the Paper to suggesting a few methods which have given good results for medium quantities and still substantial enough to be taken up again in case of repeat orders.

In all cases the plant to be dealt with is definitely intended for moulding machines working in pairs whether hand-squeezed or power-operated, and the first case applies to the type of pattern that can be conveniently made in halves, that is, split across the joint for the mould. The plates on which the patterns are to be mounted are preferably cast iron, and both are machined on each face so that they can be bolted solid on the machine bed. They are bored and reamed to the pin centres of the box parts to be used, and accuracy at this stage is most important, as all the pattern mounting and setting should follow in exact relation to these holes. For this reason the use of a master jig-plate is strongly recommended.

A decision has then to be made in locating the position of the patterns in the moulds in conjunction with gates and runners, and this should be the prerogative of the moulder responsible for the resulting castings. One half of the pattern is then drilled to take a pair of dowel pins as nearly as possible at right angles to the base side of pattern. They can then be paired together and the dowel holes continued through the other half.

The first half is put into position on the plate and one hole drilled into it. A dowel is then inserted and the other hole drilled whilst the pattern is held in position, thus ensuring that the holes in pattern and plate are exactly correct. The plates can then be placed face to face, with the box pin holes as a guide, and the dowel holes continued through the other plate. Thus the two halves of the pattern are located in correct alignment. The Author prefers this method to marking the position of the holes dimensionally.

The holes for screwing the patterns to the plate should have ample tolerance to ensure that no undue strain will be put on the dowel pins. The size of dowel pin is also important, and personal experience has shown that a small diameter steel gives the best results. About $\frac{1}{4}$ dia. allows the pin to bend and adjust itself to any inaccuracies that nearly always occur in machining a half pattern. When the requisite number of castings have been made the patterns can be easily removed and substituted by others.

Block Patterns (Iron and Cement)

Passing on to the pattern with an irregular joint, a cast-iron frame is used instead of the plate. The pair of frames carry a substantial lug at each end and then are drilled and reamed as before to the box pin centres. A complete mould is then made in a pair of accurate master boxes containing the desired patterns, with the runners carefully cut in the mould. Complete patterns are then placed in each half of the mould. These should have been previously drilled and tapped to take convenient size screws to anchor them to the cement.

The frames are then placed in position, taking care that they register accurately, and filled with cement. This gives a pair of pattern blocks with the patterns imposed on the cement joint. The chief advantage of this type is that the metal pattern is less liable to injury from any rough treatment they so frequently receive in foundry use and storage.

A variety of metals are in use, each having some special advantage according to the requirements that each job may demand and the amount of accuracy expected in the finished casting. Probably the most useful metal is a lead alloy, which, although fairly soft and easily finished, is sufficiently strong to withstand the average wear and tear of sand abrasion, and lends itself to alterations and repairs so frequently necessary. It has also the advantage of requiring a very small contraction allowance.

No doubt each foundry has its own particular alloy, and in the Author's case the composition is standardised at 75 per cent. lead, 15 per cent. tin, and 10 per cent. antimony. Where a heavier duty metal is required, as when using a Sandslinger, an addition of antimony hardens the alloy considerably.

Much use is now being made of aluminium alloys, and there is no doubt that for larger production it has many advantages. Its cleanliness, lightness, good surface and ease of machining easily outweighs the difficulty of repairs and alterations. Even the moulder seems to show a much higher regard for an aluminium pattern block or plate, and no doubt the lightness makes him show it more respect, and consequently it gets more careful treatment.

Stripping Plates

When stripping plates are considered, thought immediately turns to big production and heavy increase in cost of patterns, but it is suggested that they can be made quite economically for small quantities of castings. Especially where a casting has deep draws or square edges, a cheap stripping plate can be introduced which will then pay for itself, apart from giving a better casting and depending less on the skill of the moulder. This requires that the pattern is increased in depth sufficient to allow for the thickness of plate.

The handiest material for the plate is $\frac{1}{4}$ in. thick aluminium, with a hole cast in it outlining the shape of the patterns at the base and $\frac{1}{4}$ in. clearance all round it. If the pattern be wood that is to be mounted, the clearance can then be filled in with any of the many cements that are now on the market. Take care that the plate is registering correctly with the box pin holes. Where the pattern is cast iron, bronze or aluminium, the soft lead alloy makes an excellent filler and wears quite well.

*A Paper read before the Birmingham, Coventry and West Midlands branch of the Institute of British Foundrymen, Mr. A. J. Shore presiding.

STEEL DEVELOPMENTS IN SOUTH AFRICA

CONTINUOUS STRIP MILL PROJECT

Dr. H. J. Van der Bijl, chairman of the South African Iron & Steel Industrial Corporation, Limited, disclosed at the annual meeting in Pretoria that during the war Iscor manufactured special purpose steels to some 150 different specifications, in a works which had been designed and equipped primarily for the mass production of ordinary commercial steels. The production of special steels displaced a much larger tonnage of commercial steels, so that Iscor's total output was reduced to that extent.

In addition, the Corporation undertook on behalf of the Government, to design and construct, operate and maintain plants for the production of munitions and other war equipment. These war plants included a bomb foundry, a heat-treatment plant equipped to handle gun barrels up to 23 ft. in length, and an armour plate treating, proofing and profile cutting plant.

Output Capacity

During the year ended June 30, 1945, Iscor's steel production (*i.e.*, ingot production plus molten steel diverted to the manufacture of bombs) amounted to 518,230 tons, an increase of 52,014 tons as compared with the preceding year.

The nominal output capacity planned for their extended works was 600,000 tons per annum. The higher silica content of some of the raw material had limited output, said Dr. van der Bijl. The question of installing ore washing or other beneficiation plant was under consideration. Their aggregate rolling mill capacity was now a little ahead of their steel-making capacity.

Outlining wartime extensions of plant, the chairman said the installation of a plate mill had enabled them to supply a complete range of plates up to the maximum lengths, widths and thicknesses required in practice, whereas previously they were only able to produce a limited range of light plates in their sheet works. The installation of a medium mill had enabled them to undertake the supply of a number of products of intermediate size which were too light for rolling in the heavy mill and too large for rolling in the light mill. They were producing steel wire, both black and galvanised, in a makeshift plant which was erected during the war to assist in meeting the acute shortage of wire, especially baling, binding and fencing wire. They also embarked upon the manufacture of steel window sections, the whole of the available output being readily absorbed by the local manufacturers of steel windows. Production had recently commenced of bright steel shafting and other bright bars in a plant installed specially for this purpose. The range of bright bars that would be available for the present was limited, as not all the machines on order had yet arrived and been installed, but it was hoped that, a little later, a full range of diameters would be available. These were the main additions to the products.

Future Developments

Now that the war was over, detailed proposals were under consideration in connection with future extension projects. The immediate and potential future requirements of steel products in South Africa were much in excess of the output capacity of the local steel industry and the directors' intention was to proceed with appropriate extensions of plant so as to increase Iscor's output in step with the industrial development of the country as a whole. These extensions would take place mainly at their new steelworks site at Vanderbijl Park, where sufficient land had been acquired, both for industrial and residential purposes, to take care of developments for many years to come.

There seemed to have been a little confusion regarding the position at Vanderbijl Park, said the chairman. The new steelworks site there belonged to Iscor and it was Iscor (and not any other separate company) which was carrying out steelworks development there. At the present time, the only unit of plant installed at Vanderbijl Park was a plate mill which was being temporarily supplied with its raw material in the form of steel slabs from Iscor Works, Pretoria. The plate mill, which was at present operating one shift only, with an output at the rate of about 70,000 tons per annum, was designed to be suitable for operation in conjunction with a continuous mill installation for the production of all classes of flat rolled steel products, including light plates, sheets, strip, etc., down to tinplate gauges. The pre-war consumption in the Union of the whole range of flat steel products was nearly 200,000 tons per annum and an increased demand was developing, especially in the form of secondary industries requiring flat steel of various descriptions for re-processing into a variety of finished articles. This was the demand for which they hoped to cater from their first post-war extension scheme at Vanderbijl Park, the project under investigation being the installation of a continuous strip mill, with appropriate finishing plant and equipment, to operate in conjunction with the existing plate mill, and also the necessary coke ovens, blast furnaces and steel melting plant, with their ancillary equipment, to feed the mills with steel.

The only disquieting feature regarding future steelworks development in South Africa was the shortage of reserves of coking coal, said Dr. van der Bijl. The known resources of coking coal were limited and large tonnages were being used for purposes for which non-coking coal would be suitable, with the result that resources were being exhausted at a rapid rate. There was urgent need for the evolution of a scheme to conserve coking coal, in the interests of the future industrial development of South Africa.

Production and Sales

Sales of Iscor pig-iron during the year ended June 30, 1945, amounted to 41,909 tons. During the same period their associated company, African Metals Corporation, Limited, supplied 52,407 tons of pig-iron, making a total of 94,316 tons, which, apart from a small quantity of imported cold-blast pig-iron, repre-

Steel Developments in South Africa

sented the total supplied in the Union. The chairman indicated that now that Iscor's plant extensions were completed, virtually the whole output of iron from their three blast furnaces was required for steel-making purposes and the pig-iron demand would, to an increasing extent, be met from the African Metals Corporation's plant at Newcastle, Natal, where a second blast furnace had been installed and had recently been started up.

Total despatches of rolled and drawn steel products from Iscor's works at Pretoria and Vanderbijl Park during the year under review amounted to 359,423 tons. In addition, 13,792 tons of molten steel were diverted to the manufacture of bombs and 747 tons of forgings were despatched from the forge press. Annual despatches of rolled and drawn steel products for the past five years ended June 30, were: 1941, 243,914 tons; 1942, 242,410; 1943, 240,012; 1944, 316,914; 1945, 359,423 tons, the 1945 figure being made up as follows:—Semis (blooms, billets, etc.) for re-rolling or re-manufacture in other local works), 71,916 tons; structural sections, bars, rods and wire, 115,284 tons; rails—various weights from 30 lb. up to 96 lb. per yard, 34,616 tons; sheets—black and galvanised, flat and corrugated, 63,743 tons; plates, 67,407 tons; other miscellaneous products, 6,457 tons.

Price Comparisons

Dr. van der Bijl gave Iscor's current basis prices as follows:—Structural sections, £17 2s. 6d.; merchant bars and rods, £17 7s. 6d.; heavy rails, £17 2s. 6d.; light rails, £15 17s. 6d.; plates, £17 7s. 6d.; black sheets, £21 12s. 6d.; galvanised corrugated sheets, £26 10s. The prices of their main finished products, he said, had risen by an average of under 11 per cent. since the beginning of the war. The net prices of Iscor steel products in wholesale quantities delivered in the Rand were lower than the delivered costs of American steel by from £5 to £7 per ton and were lower than the delivered costs of British steel by from £7 to £9 per ton, on the assumption that American and British steel could be purchased for export at the home market prices. That was the position to-day, he said. Not long ago, when high war-risk insurance rates had to be paid, the differences were much greater. In some cases, the delivered cost of Iscor steel at the coast was lower than, or competitive with, the landed cost of imported steel, and in other cases (especially at Cape Town after the addition of railage for the 1,000 mile haul, which on some products was much higher than the ocean freight from Britain or America), the cost of imported steel was lower than their present price. Iscor's prices on the Witwatersrand for wholesale quantities of some of its products, for example black sheets, galvanised sheets and light rails, were at present lower than the British prices in Britain; and Iscor's prices on the Witwatersrand for retail quantities of many of its steel products were lower than the published "warehouse prices" in American cities such as Washington and New York.

Union Steel Corporation

Iscor acquired a controlling interest in the Union Steel Corporation (of South Africa), Limited, 15 years ago, and the policy then decided upon was that that Corporation's activities and developments should be directed along lines complementary to those of Iscor itself. While the circumstances of the intervening years have resulted in the Union Steel Corporation continuing to manufacture a range of ordinary rolled steel products up to the capacity of their old rolling mills, their main development has been in steel foundry work, in the manufacture of drill steel (including the development of detachable bits) upon which the gold mining industry was almost wholly dependent during the war; in the production of copper wire for power transmission and distribution for telegraph and telephone purposes, and for the manufacture of insulated cables of all descriptions; and in the manufacture, by their subsidiary, of bolts and nuts. The Union Steel Corporation is now engaged, *inter alia*, in developing the manufacture of tool steel and certain special purpose steels for which there is a local demand.

NEW TRADE MARKS

The following applications to register trade marks appear in the "Trade Marks Journal":—

"ALOCLENE"—Chemical compounds for cleaning aluminium or aluminium alloys prior to welding or coating. SUNBEAM ANTI-CORROSIVES, LIMITED, Wexham Road, Slough, Bucks.

KING'S HEAD OVER CLIFFS (DEVICE)—Furnaces, grinding and pulverising mills, machine tools, etc. KINGCLIFFE ENGINEERING COMPANY, LIMITED, Colmore Place Works, Oldfield Lane, Leeds.

"DESPATCH" and statue device.—Machine tools, tools for use in machine tools, magnets, gauges, etc. JAMES NEILL & COMPANY (SHEFFIELD), LIMITED, Composite Steelworks, Napier Street, Sheffield, 11.

"METCOLIZED"—Refractory, semi-refractory and part-refractory apparatus for metal working, etc. METALLIZING ENGINEERING COMPANY, INCORPORATED, c/o Marks & Clerk, 57-8, Lincoln's Inn Fields, London, W.C.2.

LIGHTWEIGHT PIANO FRAMES

A new lightweight frame for pianos has been devised by the Aluminium Company of America, in conjunction with a firm of pianoforte manufacturers. The new frames weigh only 45 lbs. each, compared with the original cast-iron frames weighing 125 lbs.

THE "NICKEL BULLETIN" for December, 1945, contains abstracts dealing with properties of the nickel-platinum alloys, the specification of steels to hardenability limits, spot welding of alloy steels, machinability studies, pyramid hardness testing and analytical colorimetry and photometry. This issue also contains an index of volume 18. Copies of the "Bulletin" may be obtained, free of charge, from the Mond Nickel Company, Limited, Grosvenor House, Park Lane, London, W.1.

AUSTRALIAN STEEL INDUSTRY DURING THE WAR YEARS

DEVELOPMENTS AT B.H.P. WORKS

The importance of the contribution made by the Australian steel industry to the war effort was stressed by Mr. H. C. Darling (chairman) at the annual meeting of the Broken Hill Proprietary Company, Limited, held in Melbourne.

Mr. Darling pointed out that during the years immediately preceding the outbreak of war, extensions and additions to plant brought Australia's steel-ingot capacity to 2,000,000 tons per annum. This plant, together with an efficient organisation, was ready to meet Australia's requirements, as well as to make deliveries to Great Britain at a time when she most needed them. Never at any time during the war was Australia seriously short of steel, and large tonnages were made available to the United States forces and to Great Britain.

The company was associated also with the difficult task of producing special machinery, tools and gauges essential for accurate mass production of munitions. Annexes were built at various centres, and these had turned out vast quantities of ammunition, including 250-lb. high explosive and armour-piercing bombs, and armour-piercing and high explosive shell bodies. In addition, such requirements as gun barrels and components, ammunition links, field telephone cable, submarine nets, Bren gun components and steel helmets were manufactured by their organisation.

Tungsten Carbide Manufacture

Following the declaration of the European war, Australia soon found itself cut off from supplies of tungsten carbide, essential to the maintenance of a high rate of munitions manufacture. The company turned its attention to the possibility of its being produced locally, and their Newcastle organisation developed a process for the manufacture of a suitable product in adequate quantities, despite a widespread belief that such an experiment, owing to lack of technical information and experience, would not prove successful. Another technical triumph was bullet-proof steel plate. Australia did not have the alloys to make the conventional plate, but a substitute alloy was developed from a mineral found in the sea beaches of Northern New South Wales. The bullet-proof plate produced by the use of this substitute alloy successfully met all ballistic specifications, had excellent weldability, and enabled large tonnages to be produced by quick and simple methods with a considerable reduction in cost.

Mr. Darling announced that the electric steel furnace and the forge plant erected at Port Kembla early in the war period for the manufacture of gun barrels and other ordnance requirements, had been closed down. These plants materially helped to fulfil a major requirement in meeting the demand for gun barrels. Their capital cost had been borne by the company.

The establishment of the ferro-alloy plant at Newcastle provided almost every alloy essential for special steel making, and removed the serious difficulty of obtaining adequate supplies from overseas under war conditions. The magnesium plant, constructed in 1940-41 as a wartime project, fulfilled its purpose of supplying Australia's urgent war requirements of magnesium when imported supplies were unprocurable. The demand had now fallen to such an extent as to make magnesium manufacture by this unit uneconomical, and further production was at present unwarranted, said Mr. Darling.

Shipbuilding Venture

The company's entry into the shipbuilding field comprised a major contribution towards Australia's war effort. They had built patrol vessels for the Navy, merchant vessels for the Australian Shipbuilding Board, two steamers for their own fleet to replace those lost by enemy action, barges at the rate of three per week for landing operations in the South-West Pacific, and 75-ft. ocean-going steel tugs for the United States forces at the rate of one every three weeks. This substantial shipbuilding programme included the manufacture of marine propelling engines and large quantities of auxiliary equipment.

While the foregoing might be regarded as major undertakings, other items included the production of a much wider range of special alloy steels for the munitions programme, aero-engine cylinder assemblies, the arming and degaussing of merchant steamers, the rendering of technical assistance to other industries, and the loan of technical personnel to the Munitions and other Government departments.

Continuing, Mr. Darling said that with a decline in the requirements of steel for defence purposes, business had moderated somewhat, and could not be expected to improve until Commonwealth and State Government undertakings and private enterprise changed over to peacetime requirements. At the same time, the orders that were on hand, combined with overseas orders for semi-finished steel, would keep the works busily occupied for some time ahead.

The South Australian iron-ore mines operated throughout the year commensurate with the tonnage of shipping space available. It could now be recorded that 1,364,141 tons of iron ore were obtained from several small deposits in New South Wales. This was necessary on account of the shortage of shipping on the coast. Were it not for this ore, and also the heavy stocks of iron ore at Newcastle and Port Kembla when war broke out, Australia's steel requirements would have suffered severely. These deposits in New South Wales had now been closed, as they were uneconomical when compared with supplies from Whyalla.

B.H.P. Company mining engineers had paid visits to New Caledonia for the purpose of inspecting iron-ore deposits located on the island. As a result of these visits the company had taken certain options over a large area, and at the present time was testing the property to ascertain the quantity available and the suitability of the ore.

Until the coal position improved, it would not be

Australian Steel Industry During the War

possible to recommission the Whyalla blast furnace, which had been closed down for over a year. Certain improvements had been effected, and the plant kept in first-class condition.

Port Kembla Works

Production at the Port Kembla works of Australian Iron & Steel, Limited, had been adversely affected by shortage of coal and labour. Owing to the need for increased coke production at these works, it was decided to proceed with the construction of an additional battery of coke ovens, and work had actually commenced. At the moment, however, construction had been suspended owing to the necessity for diverting labour elsewhere. Another major construction item, preliminary work for which was in hand at Kembla, was the installation of a new combination rod, bar and strip mill.

The developing and equipping of this company's ironstone deposits at Cockatoo Island, Yampi Sound, was actively proceeding, and it was desired to bring these leases into production at an early date. These ore deposits were low in manganese and eminently suitable for blending with the South Australian iron ore for steel-making purposes, and as a national project would conserve mainland supplies. It was hoped that development might be sufficiently advanced by the end of 1946 to commence mining and shipment of ore to the steelworks. Previously, when equipping quarries of this nature, heavy machinery had been imported, but on this occasion its manufacture, including the large 84-in by 60-in. crusher and the electric shovels, was being undertaken at their various workshops.

With a decrease in demands for material for defence purposes, it had been possible to divert a greater proportion of the Commonwealth Steel Company's production to commercial requirements. The demand for stainless steel polished sheets had exceeded capacity, and steps were in hand to instal additional equipment to take care of this heavy demand.

Domestic requirements of railway wheels and tyres had been met, and in addition it was possible to export a quantity of assembled wheels, tyres and axles to India.

The wire mills of Rylands Bros. (Aust.) Pty., Limited, and Lysaght Bros. & Company Pty., Limited, had been handicapped by a serious shortage of manpower in their efforts to supply fencing materials. These plants had the capacity to meet the whole of Australia's requirements, but until sufficient and suitable labour was made available there was no possibility of making the best use of the plant and equipment to afford the relief so urgently needed by the pastoral industries. With the possibility in mind of the extension of the industry to Victoria, Rylands Bros. (Aust.) Pty., Limited, had recently purchased an area of land at Geelong.

NEW PATENTS

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

571,863 MILLS, F. Doors of furnaces.

571,906 MIDLAND MOTOR CYLINDER COMPANY, LIMITED, and WOOLLEY, F. A. Melting of finely divided metal particles and furnaces therefor.

571,917 SULZER FRERES, SOC. ANON. Apparatus for use in the testing of metals.

571,937 ROBIETTE, A. G. E. Manufacture of composite or clad metals.

571,967 WYNNE, J. N. Process for the treatment of fluorspar.

571,999 WALLWORK GEARS, LIMITED, and GREGORY, H. W. Vibrating riddles for sifting moulding sand.

572,029 STEVENS, A. H. (Witter, L. L.). Method and apparatus for cutting metal such as aluminium sheets or the like.

572,031 LUCAS, LIMITED, J., and HUTTON, J. M. Manufacture of metal moulds, dies and the like.

572,034 LAMBOT & COMPANY, LIMITED. M., and LAMBOT, V. M Furnace recuperators.

572,111 BJORKMAN, E. B., and ESCOR INDUSTRIES, LIMITED. Apparatus for the disposal of industrial slags.

572,124 UNITED STEEL COMPANIES, LIMITED, and PLUCK, J. E. Furnace roofs or arches.

572,143 AUTOMATIC DIE & PRODUCTS COMPANY. Methods, machines and dies for forming tubular metal articles.

572,210 CHADWICK, R., and IMPERIAL CHEMICAL INDUSTRIES, LIMITED. Aluminium base alloys.

572,229 COURTAULDS, LIMITED, and HEGAN, H. J. Removal of metals from solutions thereof.

572,254 HOFFMANN MANUFACTURING COMPANY, LIMITED, and BROWN, A. K. Manufacture of cages for roller bearings.

572,283 INCANDESCENT HEAT COMPANY, LIMITED, and FALLON, J. Annealing pots or boxes.

572,336 MOORE, C. M. Treatment of metal bodies in chemical baths.

572,346 C.U.R.A. PATENTS, LIMITED, PIRANI, M., and HELLER, A. Manufacture of refractory materials.

572,374 HATFIELD, W. H., and BRIDGE, J. F. Process for improving the properties of iron-alloy castings.

572,376 FORD MOTOR COMPANY, LIMITED, WATERS, P. W., and SHACKLETON, J. Steels and their heat-treatment.

572,380 BENNETT, J. G., THRING, M. W., and C.U.R.A. PATENTS, LIMITED. Crucible and like furnaces.

572,415 BRITISH ALUMINIUM COMPANY, LIMITED, and RICHMOND, J. T. Solders for aluminium.

572,472 MOND NICKEL COMPANY, LIMITED, and HUDSON, F. Alloys for the manufacture of parts resistant to erosion.

CONTINUATION OF CONTROLS

By F. J. TEBBUTT

While the Emergency Powers Acts are to be allowed to expire on February 24 next, Government control will be continued with the Supplies and Services (Transitional Provision) Act, 1945. But whereas the power given by the first-named Acts was for the furtherance of the war effort, this new Act will operate under powers given to maintain, control, and regulate supplies and services during the post-war period, so as to secure a sufficiency of those essential to the well-being of the community, their equitable distribution, or their availability at fair prices. Further objects are to facilitate demobilisation and resettlement of persons, and to secure the orderly disposal of surplus material, to facilitate the readjustment of industry and commerce to peacetime requirements, and to assist the relief of suffering and the distribution of essential supplies and services in the British Empire or foreign countries in grave distress on account of war.

Fresh Defence Regulations cannot, however, be made (except in relation to one provision concerning price control—to be referred to later), the new power only extending to Parts III and IV of the Defence (General) Regulations with certain other Regulations before becoming permanent must lay before both Defence (Finance), 1939, of the Emergency Powers Acts, and this power means that any of these Regulations can be re-enacted (and adjusted to conform to the new objects) as Orders in Council. But there is an important provision, however, that any such Order before becoming permanent must lay before the Houses of Parliament for 40 days, giving opportunity for either House (Commons or Lords) if it chooses to pass a resolution of annulment.

The new provision concerning price control gives power for the controlling of prices for goods (or charges for services) of any description, and the Goods and Services (Price Control) Acts, 1939 to 1943, can be amended under this power. What this means is that Defence Regulations will be made as if under the E.P. Acts (incidentally, these must be made before February 24, 1946, when these Acts expire), bringing these new Regulations into line with the older Regulations, and so then the Orders in Council procedure can be adopted for these also. Under the price control Acts maximum prices can be scheduled, but only for classes of goods (or services); this additional power will now allow maximum prices to be fixed for different qualities or grades of goods or services, not just for classes of goods or services.

Interesting Items to Note

Of the Defence Regulations retained, these mostly concern industry generally, thus in Part IV power is given to regulate or prohibit the production, treatment, keeping, storage, movement, transport, distribution, disposal, acquisition, use or consumption of articles of any description; under this Part also comes road and rail traffic matters, requisitioning, and the agricultural industry. Part III refers to ships, aircraft, etc. Government spokesmen stated when the measure was going through Parliament, that most of these Regulations will be presented as Orders in Council under this Act, so Orders will continue for limitation of supplies, licensing, rationing of production and raw materials, etc., as now, also continued being the building regulations with an oversight of prices of materials, fuel regulations, and several agricultural regulations. For clothing, textiles, footwear, etc., the coupon business will continue, as will the points procedure (and rationing) for food, etc., but power is still there for altering coupon or point values up or down as is thought advisable, according to demand and supplies available.

The Ministry of Supply is also given further powers, so that it can function for the objects of this Act (as above), as it can under its original powers of acquiring, producing, or disposing of articles required for the public use. This 1945 Act is limited to five years, but any Order in Council can be revoked at any time; it applies to Great Britain and Northern Ireland.

COPPER SUPPLIES AND PRICES

Lord Geddes, presiding at the annual meeting of the Rhokana Corporation, Limited, said that their contract with the Ministry of Supply for the supply of copper terminated on January 31, 1945. Since that date they had sold their output partly to the Ministry and partly to Continental consumers. The outlook for the future was far from clear, as the policy of the British Government did not yet seem to have taken any definite form, said Lord Geddes. Although the Ministry of Supply was no longer under contract to buy their output, yet the English market was closed to them. The Ministry still retained in force the regulations whereunder no consumer in Great Britain could purchase except from the Ministry itself. They could not therefore resume normal supplies to English consumers with whom they had long-term contracts, entered into before the war, and only suspended by its outbreak.

The Ministry had been able to reduce substantially its stocks of copper, and they must hope that in due time sane counsels would prevail and allow them a free market, and also permit the reopening of the London Metal Exchange, so that machinery for establishing the price of copper might again exist. Until that time their markets and the price of copper were subject to a like uncertainty.

GERMAN STEEL OUTPUT

According to an agency message, Germany is to be allowed a maximum steel production capacity of 7,500,000 tons a year. The Allied Control Council has decided, it is stated, that her actual output must not exceed 5,800,000 tons without specific approval.

WILD-BARFIELD ELECTRIC FURNACES, LIMITED, are taking part in the Scientific and Inspection Equipment Exhibition to be held at Newcastle-upon-Tyne from February 12-22.

ANGLO-BELGIAN INDUSTRIAL CONVERSATIONS

PRIVATE TRADING SHOULD BE EXTENDED

Conversations have recently taken place between delegations representing the Central Industrial Committee of Belgium, under their president, M. Van der Rest, and the Federation of British Industries under the leadership of their president, Sir Clive Baillieu, and Lord Dudley Gordon, ex-president. A number of representatives of leading industries on each side have taken part in the talks, including chemicals, engineering, iron and steel, and coal. The meeting established contacts between the Belgian and British representatives and the opportunity was taken to deal with a number of specific questions.

Considerable time was devoted to a study of the changes which have been brought about in each country by war conditions and of the problems involved in reconversion from war to peace. Careful consideration was also given to the structure of industry in each country, and to its relations with the Government and other important bodies in each country.

The two delegations reaffirmed their confidence in the principle of private enterprise and their conviction that the heads of business undertakings can give the lead in the amelioration of the economic situation both in their own countries, and from an international point of view.

Future Trade

The two delegations were of opinion that, with a return to normal production, the maximum volume of trade between the two countries was most desirable. This trade should not be based on uneconomic competition, but should be founded on a genuine desire and determination to increase the economic welfare of both countries and so contribute to the revival of world prosperity. The delegations, while welcoming the limited return to private trading between the two countries announced in the middle of last year, placed on record their regret at the extent to which State controls and purchases, as opposed to private trading, still entered into the exchanges between the two countries. They were of opinion that the two Governments should take the earliest opportunity of extending the scope of private trading between Belgium and the United Kingdom.

There was complete agreement as to the necessity for the avoidance of double taxation. It was agreed to take an early opportunity of urging on the respective Governments that negotiations should be initiated for an appropriate treaty.

Considerable concern was expressed at the failure of the Allied Governments to consult their industries as to the effects which might result from new alignments following a drastic reduction of the German steel and other potential war industries. No consultations would appear to have taken place with industries in the Allied countries as to the eventual competition which German industry might cause on world markets and how it was to be controlled.

It was decided that each delegation should set up a Standing Liaison Committee in order (1) to decide on practical measures to improve the trade of both countries; (2) to study all questions of mutual interest, and (3) to provide a framework within which organisations representative of various industries could discuss matters of common interest.

It was agreed that a most useful purpose had been served by the meetings which have taken place and that they should be followed at an early date by a further meeting in Brussels.

EMPLOYMENT IN INDUSTRY

The "Ministry of Labour Gazette" for December contains figures showing the level of employment in the principal industries of the country. In the table below are figures comparing the level of employment in specified industries in mid-1939, mid-1945, and last October. The figures include only insured persons, and being figures of employment, they do not show the number of workpeople attached to any industry.

Employment Figures in Thousands.

—	Mid-1939	Mid-1945	Oct., 1945
Metal manufacture	333.4	351.7	345.1
Engineering	921.4	1,438.0	1,242.2
Vehicles (including aircraft) ..	538.9	937.4	732.8
Shipbuilding	144.7	252.3	239.2
Metal goods	820.0	886.3	824.0
Chemicals, etc.	284.4	438.1	357.6
Coal-mining	761.2	717.6	703.6
Building and civil engineering ..	1,206.5	632.0	719.8

IN PARLIAMENT

Ruhr Iron and Steel Works

MR. EDELMAN asked the Chancellor of the Duchy of Lancaster the intentions of the Government concerning the ownership and functioning of the Ruhr iron and steel works.

MR. JOHN HYND said that policy was governed by the economic principles agreed at Potsdam, which required the elimination of excessive concentrations of economic power. The British authorities had already taken over possession and control of the firm of Friedrich Krupp and its subsidiary and affiliated undertakings; and further steps would be taken, when necessary and expedient, to carry out the agreed policy.

HEAD, WRIGHTSON & COMPANY, LIMITED, of Thornaby-on-Tees, have opened a branch office in Sheffield to deal with the sale of iron and steel works plant, constructional steelwork, iron and steel castings, drop stampings and forgings, etc., in the East and West Ridings of Yorkshire, Derbyshire, Nottinghamshire and Lincolnshire. Mr. Andrew Readman, formerly of the head office staff, is the resident manager, his address being 5, Leopold Street, Sheffield, 1. Mr. B. W. Hewitt, of 90, Totley Brook Road, Totley, Sheffield, will continue to look after the company's colliery plant sales.

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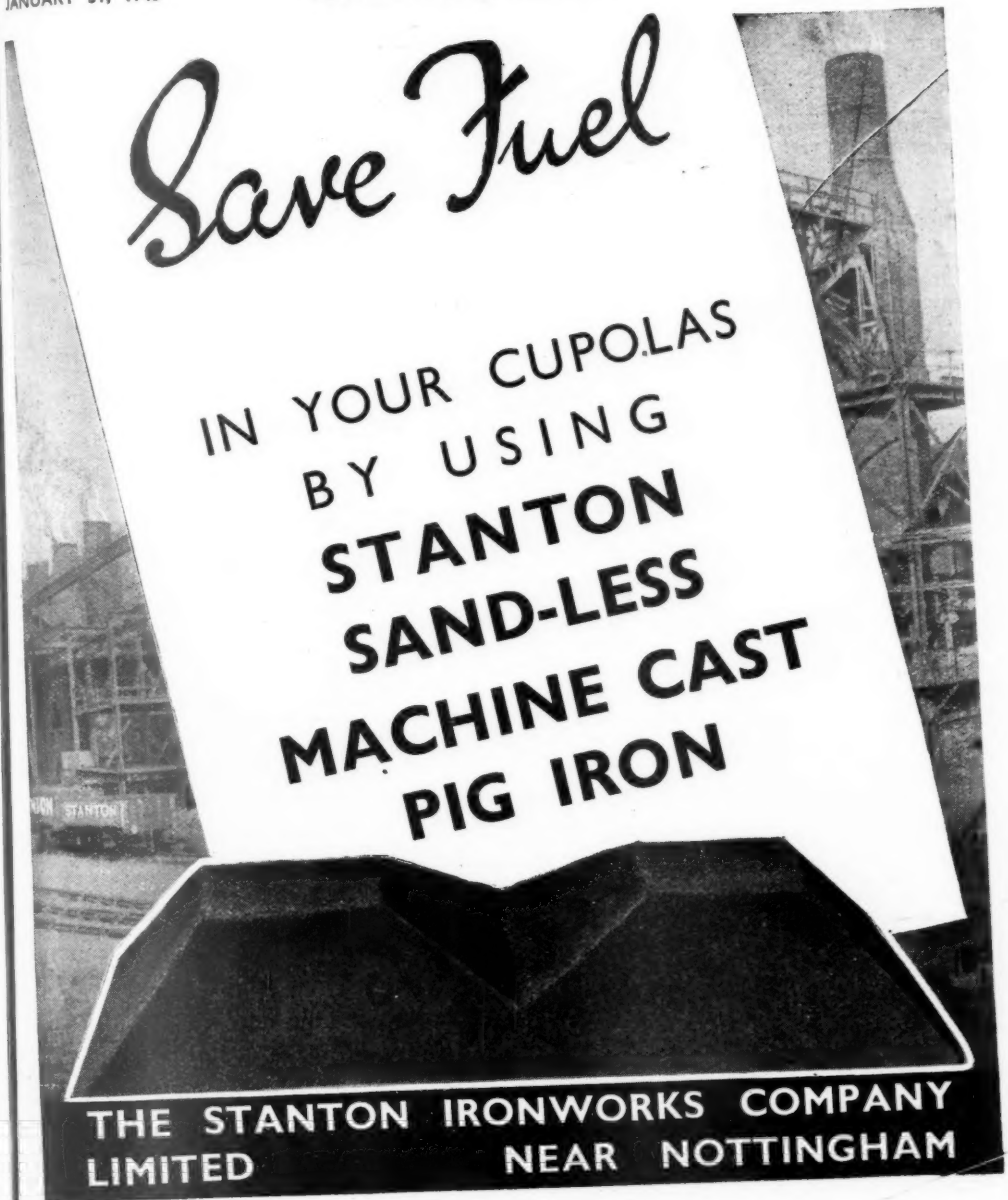


THE STANTON IRONWORKS COMPANY LIMITED NEAR NOTTINGHAM

PERSONAL

M. ETIENNE DU CASTEL has been appointed a director of the Rio Tinto Company, Limited.

LIEUT.-GENERAL SIR GIFFARD LE Q. MARTEL has been appointed a director of Greenwood & Batley, Limited, of Leeds.

MR. S. LEETCH, director and works manager of Davy & United Roll Foundry, Limited, Middlesbrough, has resigned, having accepted the appointment of steel foundry controller and local director with Hadfields, Limited, Sheffield. He will commence his new duties early in March.

SIR GEORGE H. NELSON, chairman and managing director of the English Electric Company, Limited, and MR. HENRY MAIN, managing director of the Caledon Shipbuilding & Engineering Company, Limited, have been elected members of the technical committee of Lloyd's Register of Shipping.

SIR EDWARD VICTOR APPLETON has been awarded the Faraday Medal by the Council of the Institution of Electrical Engineers. This is the 24th award of the medal, and it is made to Sir Edward Appleton for his conspicuous services in the advancement of electrical science, particularly in the field of radio propagation.

MR. JAMES STUART DUNCAN, of the Massey Harris Company, Limited, of Toronto, has been elected a director of the International Nickel Company of Canada, Limited. Mr. Duncan is chairman of the board of the Massey Harris Company and is also on the boards of various American and Canadian companies.

MR. GEORGE REID, of 19, Watling Street, Camelon, Falkirk, has been awarded the British Empire Medal in recognition of his meritorious services to wartime production in key industries. Mr. Reid has been employed by R. & A. Main, Limited, ironfounders and gas engineers, for over 20 years, and is now engaged as tool-room foreman.

DR. J. E. HURST, in recognition of his outstanding services to the City of Lichfield, has been made a "Freeman of the Worshipful Company of Smith's," which dates back for centuries. In the charter of 1601 it was referred to as "this ancient company." Dr. Hurst is Sheriff of the city. He is a past-president of the Institute of British Foundrymen.

MR. W. T. EDWARDS, managing director of Cowlishaw, Walker & Company, Limited, Biddulph, and of W. G. Bagnall, Limited, Stafford, has been elected vice-president of the Institution of Locomotive Engineers. Mr. Edwards, who has been a member of the Council for 25 years, is president of the North Staffordshire Engineering Employers' Association.

MR. D. W. COOPER, who, in February, 1942, was seconded from George Cohen, Sons & Company, Limited, to take up the appointment of Assistant Controller of Machine Tools at the Machine Tool Control, and has for the last year been Director of Machine Tool Disposals, has joined the board of the Selson Machine Tool Company, Limited, an associate company of George Cohen, Sons & Company, Limited.

SIR WILLIAM LARKE, K.B.E., D.Sc., is retiring from the position of Director of the British Iron and Steel Federation on March 31 next. He was appointed the Director of the National Federation of Iron and Steel Manufacturers in 1922, and has been associated with the progressive organisation of the industry since that date, culminating in the present British Iron and Steel Federation and the British Iron and Steel Research Association. Sir William has made a complete recovery from the major operation he underwent early last year. He has resumed, and will continue, his various public and other activities.

Wills

FLETCHER, J. Y., a director of the General Electric Company, Limited £74,68

LATHE, ALFRED, of Penn, Wolverhampton, ironfounder, of Chas. Lathe & Company, Limited, Tipton ... £42,75

MACDIARMID, SIR ALLAN, formerly chairman and managing director of Stewarts and Lloyds, Limited £111,27

ALLDAY, P. G., of Leamington Spa, governing director of P. G. Allday & Company, Limited, brassfounders, Birmingham £47,61

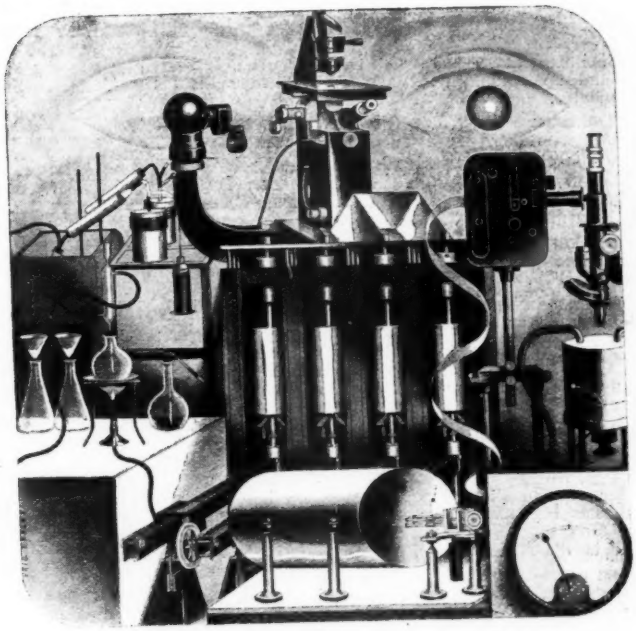
WEDGE, J. H., of Wolverhampton, managing director of B. F. Wedge & Company, Limited, galvanisers, Willenhall, and of Edward Howell (Galvanisers), Limited, Birmingham £40,85

INDIAN IRON & STEEL COMPANY, LIMITED

REMODELLING THE WORKS

Presiding at the annual meeting of the Indian Iron & Steel Company, Limited, Mr. T. Leslie Martin (chairman) pointed out that the company was greatly interested in steel through its close association with the Steel Corporation of Bengal, Limited. Apart from their very substantial holding and other interests in this concern, the commencement of the operation of the new Duplex plant at Napuria, now nearing completion, would approximately double the requirements of hot metal from their Hirapur and Kulti furnaces.

During the war years the plant at both works had been in constant operation, with little or no opportunity to provide for necessary renewals and repairs, with the result that they now had a heavy programme of plant replacement and rehabilitation to carry out. Their consulting engineer, Mr. Bengtson, had made an exhaustive examination of the whole of the plant, both at Hirapur and Kulti, and had since submitted his report. At Hirapur they had to instal a modern coke oven and its ancillary plant to take the place of the original four coke-oven batteries installed some 25 years ago, which to-day were obsolete. They had had in mind for some years a complete remodelling of the Kulti Works, which was very old. Their plan was an entire remodelling on modern lines of the foundries, which constituted the major activity of this works. Towards this end some two years ago they decided to instal a modern spun pipe plant at an expenditure of some Rs. 40 lakhs to take the place of the old pipe foundries. This plant had just commenced operations. The installation of the new major plant would extend over a period of some five years or so and would mean heavy capital expenditure.



Design by Eric Fraser

MOSAICS OF STEEL

NUMBER TWELVE

A large proportion of the inventions, discoveries and improvements takes place in Works Laboratories, by force of circumstances arising out of day-to-day production. Yet, although this organisation has many Works Research Laboratories attached to its large producing units, this is not considered enough. So there has been equipped and organised a central Research and Development Department whose functions are wider, which undertakes investigations of a character beyond those appropriate to a works laboratory, of common interest to all the works, and to the industry generally and bordering upon pure research. Such an organisation is of necessity closely in touch with Research Associations in the industry and with academic and state Research organisations, so that it contributes, both in material and service, to the general pool of knowledge of the scientific world.

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NEWS IN BRIEF

SEDGELEY ENGINEERING COMPANY, LIMITED, is being wound up voluntarily. Mr. G. J. Shedden is the liquidator.

THE BRITISH CAST IRON RESEARCH ASSOCIATION have issued with their latest bulletin an index to vol. 7 (Nos. 1-12).

DAVID BROWN & SONS (HUDDERSFIELD), LIMITED, have opened an office at 71 & 72, Atlantic Chambers, 7, Brazennose Street, Manchester.

THE FIRST CARGO of Swedish iron ore to reach Liverpool since 1940 arrived in the steamer "Laponia" from Narvik at the beginning of last week.

DURING THE WAR PERIOD, the Alfred Herbert, Limited, (Coventry) War Fund, formed to send comforts to serving employees, raised a total of £85,000.

I.C.I. METALS, LIMITED, is being wound up voluntarily. Mr. G. Norton, I.C.I. Metals, Limited, Kynock Works, Witton, Birmingham, is the liquidator.

AN OFFICE is being opened in Sheffield by the Export Credits Guarantee Department to facilitate the expansion of export trade in steel, tools and cutlery.

THE FIRM OF H. W. Lindop & Sons, Limited, of Walsall, has been elected to membership of the British Cast Iron Research Association. Col. C. A. Lindop is to be the representative.

THE PARTNERSHIP between Mr. S. Robinson and Mr. A. J. Stokes, brassfounders, carried on as J. H. Robinson & Sons, 54, High Street, Bromley-by-Bow, has been dissolved, insofar as Mr. S. Robinson retires from the firm.

THE SHIPBUILDING EMPLOYERS' FEDERATION has rejected the claim of the Confederation of Shipbuilding and Engineering Unions for a 40-hr. working week without a reduction in wages in the shipbuilding and shiprepairing industry.

MR. ERNEST BEVIN, the Foreign Secretary, opened at Egham, Surrey, recently, the Ministry of Labour's Industrial Rehabilitation Centre. The Centre is at present the only one of its kind and draws its resident patients from all parts of the country. It is hoped to open similar centres in the North and the Midlands.

CASTINGS RECLAMATIONS, LIMITED, of Garden Row, Coventry, are operating a patented process for the reclamation of defective castings, both ferrous and non-ferrous. The process used is based on pressure-impregnation. In the field of aero-engine components, the firm state that of 38,000 castings treated only 800 had to be returned to the melting pot.

BIRMINGHAM STEEL COMPANY, LIMITED, of Station Street, Tipton, Staffs, announce that as their foundry was partially destroyed on January 22, the execution of orders on hand will be necessarily delayed as a result. In the meantime, reconstruction is progressing with all speed, and it is hoped to have part of the plant in working order within the next week or so.

AGRICULTURAL MACHINERY is to be manufactured by Tullos, Limited, of Aberdeen. Many of the executive staff employed at Tullos under the Ministry of Aircraft Production will be taken over by the new company. The work of clearing out unnecessary plant is now going on, and the acquisition and installation of suitable machinery is proceeding as rapidly as possible.

MR. GEORGE BUCHANAN, Glasgow M.P. and Under-Secretary for Scotland, was presented with a gold watch and other gifts by members of the United Pattern-makers' Society in Glasgow, recently. Mrs. Buchanan also received gifts. The presentation was in recognition of his 15 years' service as national president of the Society, with which he has been associated for 25 years.

THE COUNCIL OF the Institute of Welding invite competition for the award in 1946 of the bronze medal endowed by Sir William J. Larke, K.B.E., a past-president of the Institute. It has also been decided in this year's competition to award a first prize of £50 to the winner of the medal, and other prizes, of a total value of £50, to be allocated at the discretion of the examiners.

OVER 550 CHILDREN of the employees of Renfrew Foundries, Limited, of Hillington, Glasgow, were entertained at a New Year Party on January 19. Mr. J. Vickers, the general manager and director, and his wife and family were present. This was the first event of an ambitious workers' welfare programme, and it is hoped by such means to foster a spirit of comradeship and goodwill among the workers.

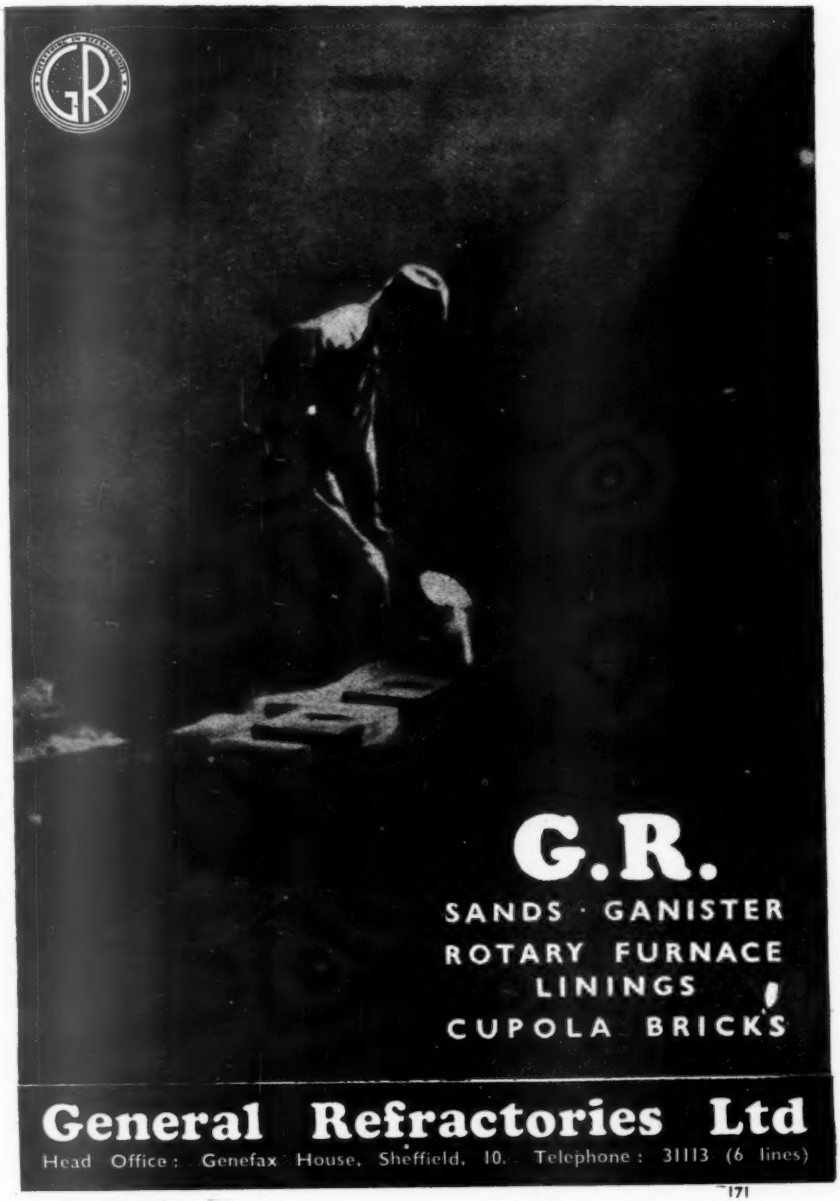
AT THE REQUEST of the President of the Board of Trade, the Shipbuilding Conference has arranged to send a mission, fully representative of the United Kingdom shipbuilding industry, to visit Argentina, Brazil, Chile, Peru and Uruguay. The mission, which is expected to leave Britain at the beginning of next month, will be led by Sir Wilfrid Ayre, of the Burntisland Shipbuilding Company, Limited.

THE X-RAY ANALYSIS GROUP of the Institute of Physics announces that its 1946 conference will take place at the Royal Institution, London, on July 9, 10 and 11 next, and will be open to all without charge. Further information will shortly be available from Mr. F. A. Bannister, F.Inst.P., hon. secretary, Department of Mineralogy, British Museum (Natural History), Cromwell Road, London, S.W.7.

AN ORDER for a 9,300-ton cargo vessel has been received by William Doxford & Sons, Limited, Pallion, Sunderland, from a Liverpool firm. The vessel is to be supplied with Doxford Diesel engines. Sir James Laing & Sons, Limited, Sunderland, have contracted to build for the Trader Navigation Company, Limited, of London, a cargo steamer of 7,500 tons. The engines will be supplied by the North-Eastern Marine Engineering Company, Limited, Wallsend.

PRICE OF ANTIMONY RAISED

Increases in the price of antimony are announced as follow: English, 99.6 per cent., is advanced by £12 10s. to £125 per ton, and 99 per cent. by a similar amount to £117 10s. per ton. Crude 70 per cent. has been raised £10 to £100 per ton.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OBITUARY

MR. ERNEST A. C. DELL, chief draughtsman with Tecalemit, Limited, died recently. He had been with the company for 13½ years.

MR. HAROLD SIMPSON MUNNINGS, London representative of A. G. Sutherland, Limited, of Birmingham, died on January 17, at Surbiton.

MAJOR F. C. EARL, director and general manager of the Sheffield Wire Rope Company, Limited, Darnall, Sheffield, has died suddenly at his home at Tuxford, Notts.

MR. HENRY JONES, director and secretary of John Spencer & Sons (1928), Limited, engineers, of Newburn, has died suddenly. Formerly with Steel, Peech & Tozer, Limited, of Sheffield, he joined John Spencer & Sons in 1929. Mr. Jones was 51.

MR. CHARLES GEORGE CARLISLE, managing director and joint founder of C. J. Carlisle & Company, Limited, Sheffield, died on January 18, aged 67. Formerly a metallurgist with Thos. Firth & John Brown, Limited, of Sheffield, he founded the firm of C. J. Carlisle & Company, Limited, under the name of Carlisle, Wiles & Company, Limited, in 1920. He was a member of the Iron and Steel Institute, and a Mappin Medallist.

LORD PLENDER, senior partner of the firm of Deloitte, Plender, Griffiths & Company, who died on January 19, aged 84, had taken part in many investigations and audits on behalf of the Government and other public bodies. He was on the Coal Mining Royalties Tribunal, 1937, Committee of National Expenditure, 1931, the Iron and Steel Committee's Economic Advisory Council, 1929, and the Export Credits Guarantee Committee of Inquiry, 1928. He was independent chairman of the Advisory Committee, Trades Facilities Act, 1921.

MR. THOMAS RICHARD CANNING died recently at Stratford-on-Avon, He was 81. As a young man, Mr. Canning went to work for his great-uncle, Mr. W. Canning, then engaged in developing the silver plating industry. Mr. T. R. Canning was keenly interested in all the processes. During the 'eighties he made a close study of nickel plating, and eventually laid the foundation of the largest business of its kind in Europe. By extensive travel he built up a world-wide connection. He retired from active business in 1920, but retained the position of vice-chairman of W. Canning & Company, Limited.

MR. FREDERICK SAMUELSON, for many years chief turbine engineer of the British Thomson-Houston Company, Limited, died at Rugby on January 21. Born in Sweden in 1866, he was associated with the B.T.-H. Company for 44 years, having joined the staff as chief draughtsman in May, 1897. Mr. Samuelson was one of the pioneers in the development of the steam turbine in Great Britain, seeing it grow from the simple Curtis type two-stage velocity compounded vertical machine of 500 kw. to the 75,000 kw. multi-cylinder horizontal turbo-alternator as installed in Barking Power Station. His reputation was world-wide. He relinquished his appointment as chief turbine engineer in June, 1939, having then been a director of the company since 1934.

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Bansted Boilers, 30, Budge Row, London, E.C.4—£1,000. H. Leaver and A. J. Sims.

H. & G. Engineering—£5,000. E. E. Rice and E. S. Hill, 2, Latymer Court, London, W.6.

Kellett Engineering Company, 34, Great George Street, Leeds, 1—£100. R. P. and J. E. Kellett.

Bamber Electrical & Engineering Company, 170, Piccadilly, London, W.1—£1,000. D. P. and L. Bamber.

Porous Chrome Plating Company, Sheepbridge Works, Chesterfield, Derby—£100. G. Nicholson and F. W. Stokes.

W. Oliver & Sons (Glossop), 85, High Street, Glossop—Sheet metal workers, etc. £7,000. F., L. and W. Oliver.

Alfred E. Thomas—Iron and steel merchants, etc. £100. A. J. Corbett, 95, Leominster Road, Birmingham, 11, subscriber.

Lonsdale Electrical & Mechanical Products, 126, Great Church Lane, London, W.6—£100. J. Peace and D. W. Warburton.

British Power Alloys & Plastics Company, Waters Road, Kingswood, Bristol—£2,000. J. W. Slade, W. E. Love, and H. W. Evans.

CONTRACTS OPEN

Any date given is the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

London, S.E., February 20—Sewer ironworks, tools, iron, etc., for Southwark Borough Council. Mr. D. T. Griffiths, town clerk, Town Hall, Walworth Road, London, S.E.17.

London, S.W., February 13—Iron bars, etc., iron castings, tools, for Wandsworth Borough Council. Mr. R. H. Jerman, town clerk, Municipal Buildings, London, S.W.18.

London, E.C., February 16—Castings, tools and general plant for 12 months from April 1, for Finsbury Borough Council. The Borough Engineer, Finsbury Town Hall Annexe, Rosebery Avenue, London, E.C.1.

London, W., February 12—Gully grates, etc., iron goods, heavy iron and mild steel, electric cables, for 12 months from April 1, for the Kensington Borough Council. Town Clerk's Office, Town Hall, London, W.8.

Wolverhampton, February 16—Iron castings for gully, manhole and ventilator tops and frames, galvanised cylinders, cisterns and boilers for 12 months from April 1, for the County Borough Council. Mr. W. Mervyn Law, borough engineer, Town Hall, Wolverhampton.

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Raw Material Markets

IRON AND STEEL

Many light foundries are having to turn down new business because of poor prospects of delivery. Some foundries have so much work on hand that they are trying to sub-let a part of it, but without much success. Large quantities of light castings are required in increasing tonnages for the building and allied trades, and it is hoped that the labour position will speedily improve. The difficulty will then arise as to the source of extra high-phosphorus pig-iron, with coke for additional furnaces at a premium. Imports of this pig-iron may become possible later, but the Control will not find it an easy matter.

The position is less stringent with regard to low- and medium-phosphorus iron, hematite and refined pig, the demand for which emanates almost entirely from the general engineering and jobbing foundries. Many of these foundries are back on peace contracts, but some find the transition period slow, and at the moment could take on more work. The engineering foundries can get all their reasonable requirements in pig-iron, but all pig-iron sales are subject to licence and there is little early prospect of a free market. Supplies of scrap, both cast-iron and steel, are satisfactory, and considerable tonnages are now being negotiated.

Deliveries of foundry coke are just sufficient, but there are complaints in some areas of delays in transit. Heavier quantities would be purchased if buyers had a free hand. Ironfoundries experience no difficulty in obtaining their needs in ferro-alloys, limestone and ganister.

With all the re-rollers very heavily booked for the whole of the current period, and many well into the next quarter, there is no easing in the demand for billets, blooms and sheet bars. The sheet mills are pressed for supplies, the bulk of the orders being for home industry. The demand is keen for all flat-rolled products, black and galvanised, but pressure is greatest for thin gauges. Billets for the rollers of bars, sections and strip are scarce, and stocks are being worked down. English and Welsh makers of semis are doing their utmost, but despite high outputs they cannot produce sufficient, and the Control are obliged to find sources of supply abroad. Both Canada and Australia are sending supplies, but not enough to meet the needs. Re-rollers are making every use of the rather limited supplies of defective billets, crops, etc. Trade in heavy finished steel products, and also in light bars and sections, is fully maintained.

NON-FERROUS METALS

The general position of the non-ferrous metals trade has shown little change following the rise in the price of lead.

The rejection is announced, by the Nigerian Chamber of Mines, at a recent meeting, of the Ministry of Supply's suggested new contract price for tin. The price fixed by the Ministry was £300 per ton, f.a.s. Nigeria, plus a bonus of a specified production figure, was exceeded. One reason given for the rejection is that at the suggested figure, certain companies would operate at a loss. Alternative suggestions by the Chamber are to be submitted to the Ministry of Supply.

The demand for zinc continues on favourable lines, and the supply position gives no cause for anxiety. The fact that the price of zinc has not as yet gone up is reassuring. Zinc sheets are also in good demand.

DRY NITROGEN AS AN ALUMINIUM FLUX

When Hansen and Slater reported that dry nitrogen produced "a distinct improvement in soundness" but did not promote complete soundness and was somewhat less effective than chlorine, it is the view of Mr. P. M. Hulme that these investigators made the error of bubbling the nitrogen through the melt too quickly. In the November issue of "Materials and Methods," he claims that with a slow speed of bubbling, dry nitrogen gathers the finely disseminated slag and dross particles and brings them to the surface, where they can be skimmed off. Moreover, relatively large bubbles of nitrogen attract the smaller bubbles of entrapped hydrogen and the like, and so reduce the overall gas content. The suggested method of introducing nitrogen is by using a ½-in. pipe, the end of which is closed, but the last 2 in. carry $\frac{1}{32}$-in. holes drilled uniformly therein. The gas treatment should continue for 20 mins., and for an 800-lb. melt, 24 in. deep, the nitrogen flow should be of the order of 24 cub. ft. per hr. at a pressure of 2 lbs. per sq. in.

PRACTICAL MEASURES

A scheme is on foot to increase the labour force of the ironfoundry industry. So far as the engineering side is concerned, discussions are now in progress at the Ministry of Labour between its officers, representatives of the employers and the trade unions, whereby ex-Servicemen are to undergo an intensive course of training to fit them for the semi-skilled occupations within the industry. Simultaneously, there is to be an upgrading of the semi-skilled men to turn them into skilled moulders and coremakers. Details of the scheme will be released by the Ministry of Labour in a few weeks' time, as obviously such a change involves negotiations as to employees' remuneration during and after qualification.

NEW CATALOGUE

Demineralised Water. The Permutit Company, Limited, of Permutit House, Gunnersbury Avenue, London, W.4, have sent us a 12-page brochure entitled "Distilled Water—Without Distillation." This was of particular interest, as only a day or two prior to its receipt we had seen the apparatus described in operation at a large technical college, where it replaced the usual distilling apparatus used for supplying a suite of chemical laboratories with "distilled" water. The process is said to remove lime, magnesia, common salt, sodium bicarbonate, alkalis, and sulphates.